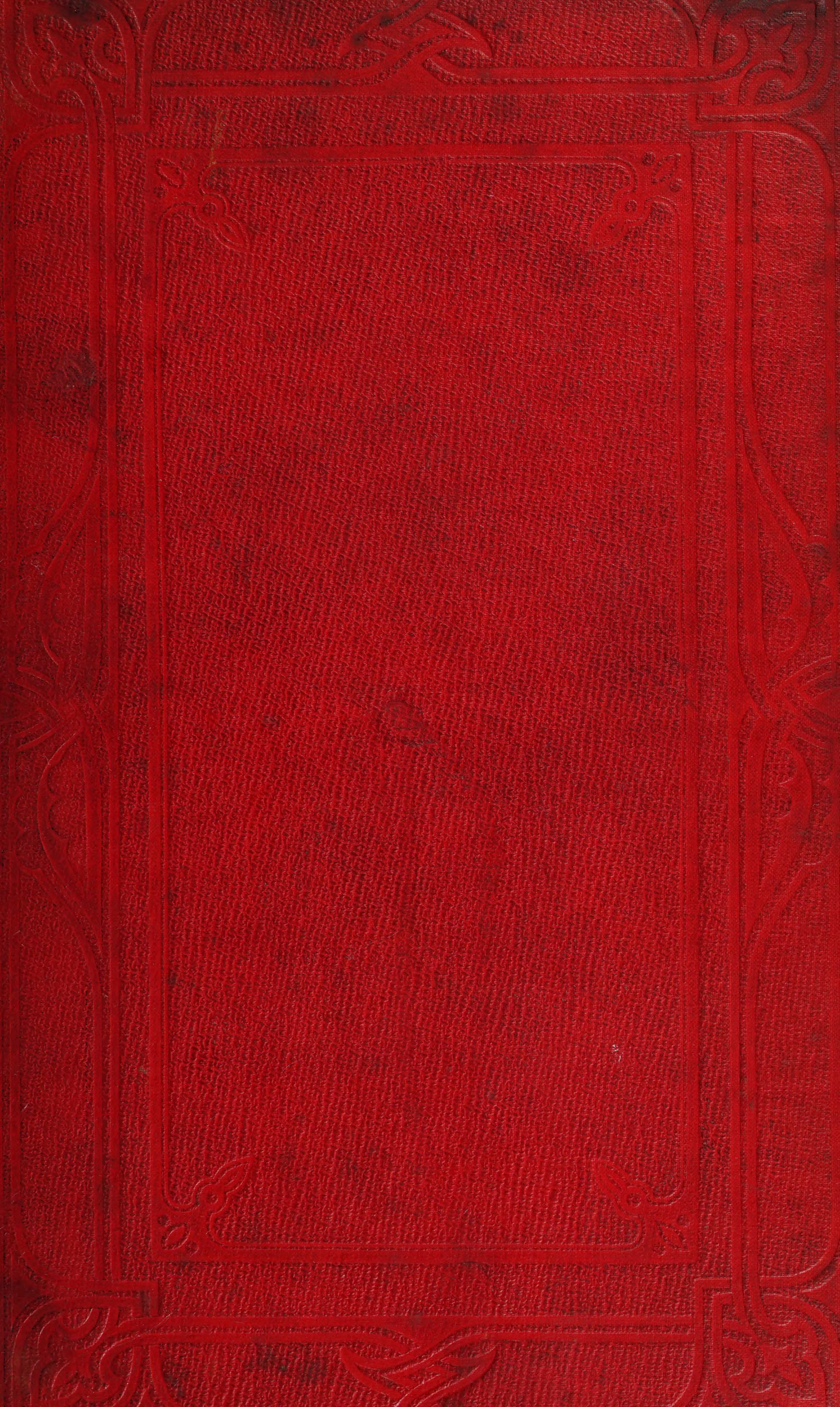

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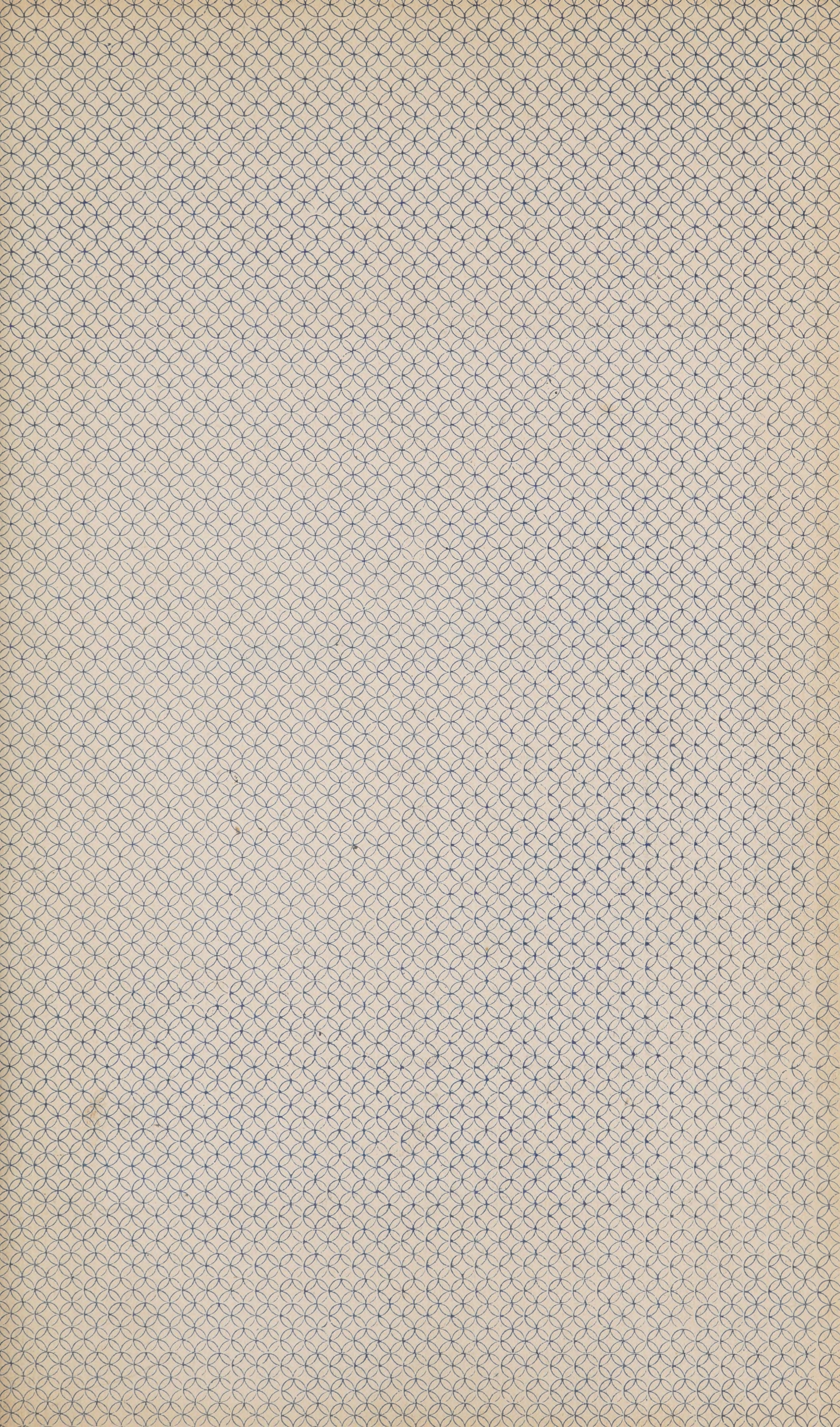

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REES, G.O.
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ON

DISEASES OF THE KIDNEY.

ON THE
NATURE AND TREATMENT
OF
DISEASES OF THE KIDNEY
CONNECTED WITH ALBUMINOUS URINE,
(*MORBUS BRIGHTII.*)

BY

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PREFACE.

The contents of this volume may be regarded as a publication, in an extended form, of a few lectures delivered at Guy's Hospital.

It has been my object throughout to place the matter before the reader as concisely as possible, in order to give a correct general idea of the disease, and to avoid, as far as admissible, dealing with minute details, which cannot well be committed to memory by reading, but which experience will not fail to teach at the bedside, to all those who possess a well-digested and connected view of the subject.

As regards the morbid appearances observed in the kidney after death, I have contented myself with referring to the Atlas of Rayer, and to certain plates in Bright's Medical Reports, not wishing to encumber this volume with an atlas, or increase its price by drawings, which would little more than represent that which has already been figured.

For more detailed information on chemical analysis, especially as connected with this subject, I must refer to my work on the "Analysis of the Blood and Urine, &c."

With respect to the great physician whose name has been used to designate the disease treated of, I feel I need not expatiate upon the claims he has to the gratitude, not only of the profession, but of the human race. Any eulogium on my part is needless, for the reason that the friends and old pupils of Dr. Bright are now gratified with the reflection that his talents and great discoveries are universally appreciated and known throughout the civilised world.

59, Guildford Street,
Russell Square,
December 29th, 1849.

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ON

DISEASES OF THE KIDNEY

CONNECTED WITH

ALBUMINOUS URINE.

THAT the presence of albumen in the urine is frequently an indication of morbid change in the structure of the kidneys, is a fact now fully recognised by the profession, and the value of this pathognomonic sign has been enhanced rather than diminished by inquiry. The application of a more correct chemistry has done much towards effecting this, as the subject is now less frequently confused by albumen being declared present when such is not the case; and, on the other hand, when it may be present, it is less likely to be overlooked than formerly happened as a consequence of the imperfect chemistry of the observer.

Though we do not even now presume to assert that albumen in the urine of necessity indicates lesion of the kidney, still we feel no difficulty in broadly stating that it will scarcely ever be found dissolved in that secretion, unmixed with red particles or pus, unless the kidney be involved in disease, and that to an extent requiring the unremitting and diligent attention of the medical adviser. Since the writings of Wells and Blackall on dropsy, and the publication of the important discoveries of Dr. Bright, much valuable information has been afforded us by minute microscopical examination into the healthy as well as the pathological anatomy of the kidney. I shall first proceed to describe those changes of structure which post-mortem examination has shown as the results of those diseases of the organ attended with the excretion of albuminous urine.

MORBID ANATOMY.

The various morbid appearances observed in the kidney in connection with the presence of albumen in the urine have been differently classed by pathologists.

Dr. Bright, in his first notices on the subject, inclined to the opinion that these appearances might probably be considered as different stages of the same disease, and speaks of three stages: the first of these being one of simple congestion; the second the result of deposit in the organ, producing a mottled or granulated appearance; and the third and most advanced stage, that in which, by continued deposit, the organ has become impermeable to blood, hard, and occasionally contracted. Many writers of eminence, both in this country and abroad, have at different times advanced opinions as to the exact nature of these morbid changes in the kidney. These opinions have varied: first, as to whether the lesions are different in kind; and, secondly, on the assumption of such difference, as to the exact nature of the morbid changes.

Rayer, in that part of his valuable work which treats of albuminous nephritis, proposes to divide the post-mortem appearances observed into six forms. Two of these he considers belong to the acute and early stage of the disease, and, as such, are but rarely met with, the disease seldom proving fatal at an early date; the remaining four forms belong to the chronic disease. I shall proceed to describe these six forms, chiefly because by studying them the reader will become familiar with a great variety of morbid appearances observed in this disease, and so have his mind well prepared to enter upon the divisions of the subject, and the generalizations proposed by later writers, and not because I in any way agree in the propriety of the distinctions proposed by the author.

1*st Form* (see Rayer's Atlas, fig. 1, plate vi. and figs. 2 and 3, plate x.)—Kidney increased in size; firm without hardness; surface morbidly red, more or less brightly tinted; studded with red points, somewhat darker coloured than the organ generally. Mucous lining of the pelvis and calices injected.

2*d Form* (Atlas, pl. vi. figs. 2 and 3, and plate vii. fig. 5.)—Kidney increased in size; consistence firm; marbled or mottled on the surface, owing to red spots occurring on a white or yellowish ground.

3*rd Form* (Atlas, plate vi. fig. 4).—Kidney increased in size; cortical substance of an uniform pale rose or yellow tint; small vessels injected with blood occasionally spotting the surface of the organ.

4th Form (Atlas, pl. viii. figs. 1 to 6; pl. ix. figs. 1 and 8,—the granulated kidney of Bright).—Small granules of a milk-white or yellowish colour infiltrating the whole organ. This appearance, on a section of the organ being made, forms a striking contrast with the inflamed reddened state of the tubular structure.

5th Form—Kidneys larger; granulations more marked; lobules more distinctly marked than in health.

6th Form (Atlas, pl. vi. fig. 5; pl. vii. fig. 6; pl. x. figs. 8 and 10).—Kidney sometimes smaller than natural, hard, and nodulated on the surface; granular appearance obliterated; some few granulations sometimes to be observed by section.

After having examined the plates of Rayer's Atlas quoted in the above descriptions, I would next advise the reader to turn to the figures in Bright's Reports, which are far better executed than those in M. Rayer's Atlas.

On examining Dr. Bright's plates, it will at once be observed that the division of M. Rayer into six forms is scarcely necessary, and, indeed, that the subject is rather encumbered than elucidated by it. The congestive stage noticed by both these authors, and admirably figured in Bright's work (Plate V.), appears to be followed by deposit in the organ, and occasionally by contraction of its substance; and no object would seem to be answered by the minute distinctions Rayer has made, and which are scarcely warranted by the appearances observed. Martin Solon, it may be stated, though adopting Rayer's classification in the general, regards his 4th and 5th forms as one and the same.

Dr. Christison, in his work on Granular Degeneration of the Kidneys, has treated this part of his subject in a truly philosophical spirit. He proposes that the following morbid appearances should be distinguished, merely in order that their relationship or differences may hereafter be traced out:—

1. Congestion, with or without granular deposit.
2. True granular degeneration, both finely granular and botryoidal.
3. Degeneration by softish yellowish matter.
4. Disseminated tubercles.
5. Cartilaginous induration.
6. Atrophy.
7. Simple anæmia (doubtful as an independent disease.)

Dr. Christison, in regarding generally these morbid changes in reference to the pathology of the subject, considers it advisable to divide them into three stages: the first, that of congestion; the second, of deposit in the cortical position; and the third, in which the cortical and tubular structures become more or less obliterated. He considers it highly probable that the various forms of degeneration described by authors do not belong to the same morbid change in the kidney,—an opinion which I shall show has gained ground as this subject has been further examined, and more especially in reference to its minute anatomy.

That the kidneys should be liable to the invasion of disease showing itself in the form of deposit of a character varying not only in relation to the nature of the diseased action, but also according to the constitutional peculiarities of the person attacked, is more than probable; and it is almost certain that such a view would have prevailed immediately on the discoveries of Dr. Bright being made known to the world, had not the matter been confused by the notion that the excretion of albumen in the urine as a constant effect necessarily indicated a *peculiarity* of lesion as its cause. That more than one cause can produce the same effect is, however, daily brought before our consideration in the practice of medicine, and it requires but little deliberation to perceive that deposits, whether cancerous, strumous, or of adhesive character, must be equally capable of producing analogous, though not identical, physical conditions in the structure of the kidney, of causing albuminous urine by interrupting circulation through the organ, and of obliterating eventually all traces of its normal anatomy. Congestion from causes which bear a more general relation to the circulatory apparatus—such as obstruction to the return of blood through the renal vein, or, on the other hand, a rapid determination of arterial blood to the kidney as the result either of an inflammatory condition or of suppressed cutaneous excretion,—are both causes competent to produce the symptom of albuminous urine; and cases of the latter kind, chiefly owing to their connexion with dropsy after scarlatina, and by their easily admitting of cure, were early distinguished from the graver forms of albuminuria. It has required, however, a more intimate acquaintance with the healthy and morbid anatomy of the kidney, to enable us to trace differences in the character of the morbid deposit by which the kidney becomes eventually infiltrated. The microscope has here been eminently serviceable, and we have now determined with certainty that the deposit which so frequently interrupts the function of the organ varies greatly, and is the result of morbid actions differing materially in character. This view of the case has been more especially confirmed by the observations of Johnson, Simon, and Busk, described in valuable communications published in the Medico-Chirurgical Transactions.

The various appearances of the kidney in Bright's disease are described by Rokitansky as dependent on the degree and rapidity of the disease, or on the stage of development; the former being subject to modification according to the power of reaction in the organ, and also to the state of dyscrasia of the blood.

In accordance with this idea, he describes eight varieties in the form of the disease. There is nothing new in the descriptions given by this author, the various appearances he mentions having been figured in the works of Bright and Rayer. The kind of dyscrasia of the blood which modifies the character of the deposit in the kidneys consists, according to Rokitansky, in an excess of albumen. It would appear, however, that, even if this be the explanation of some of the less important varieties in the deposit, we must look for the more prominent differences rather in an essential variation in the constituents of the blood tending to produce deposits which in all probability have their analogues in other tissues affected by disease.

Considering the subject in this light, the question may naturally arise—In what does the disease known as "Bright's disease" consist? Some authors have ventured to affirm that the name should be confined to that change in the kidney characterised by the presence of an excess of fatty matter in the organ. This is obviously erroneous, inasmuch as Dr. Bright has described and figured disease of the kidneys in connection with albuminuria, which possesses none of the characters above alluded to. The term "Bright's disease" is with more propriety to be regarded as embracing more than one disease of the kidney capable of causing albuminous urine, and accompanied by congestion or deposit. The term is only objectionable in not being sufficiently distinctive for the present state of our knowledge; but it is convenient as a generic one, and there appears no very great objection to its use on such an understanding.

As it is to a knowledge of the changes occurring in the minute structure of the kidneys that we are more particularly indebted for a clear perception of the true character of the diseases affecting the organ, I will now proceed to describe what has been done in this important branch of pathological anatomy.

ANATOMY OF THE KIDNEY.

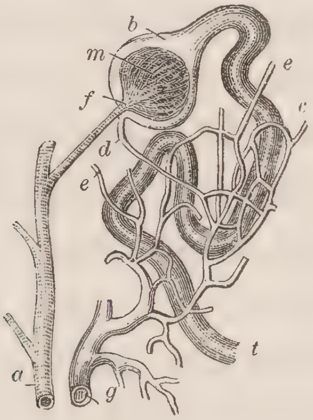
Although it is not my intention to enter upon a full anatomical description of the healthy kidney, it is still necessary to a proper understanding of several of the phenomena observed in disease, that the reader should be generally acquainted with the recent researches into the minute anatomy of the healthy organ; and I shall therefore, as a preliminary step, proceed to describe as concisely as possible the arrangement of the various structures composing the kidney, in accordance with the views entertained by most anatomists of the present day.

The kidneys are situated in the lumbar region: the weight of each organ in the healthy adult may be estimated at from three to four and a half ounces. In length the kidney measures about four inches; in breadth, two inches; and in thickness about one inch. The form of the organ is too familiar to need description.

In respect to its more obvious structure, the kidney has been divided into two portions by anatomists—viz. the cortical or external, and the tubular or internal portion. This distinction, however, is correct only so far as the unassisted eye is concerned, microscopical anatomy having shown that the cortical or outer portion of the kidney possesses a tubular structure, the tubes composing it differing in size, but being continuous with those whose presence in the inner part of the organ has gained for it the especial name of the tubular portion.

The arrangement of the minute structures composing the cortical substance of the kidney was not described by anatomists with any degree of precision until within the last six or eight years; and we are more especially indebted to Mr. Bowman for the light thrown upon this interesting branch of minute anatomy by his paper published in the Philosophical Transactions for 1842, entitled "On the Structure and Use of the Malpighian Bodies of the Kidney." For detailed information on this part of the subject, I shall content myself by referring to the above-mentioned communication, and also to a paper by Mr. Toynbee in the 29th volume of the Medico-Chirurgical Transactions, in which some difference of opinion is shown to exist between the authors—on points, however, which are of minor importance—in reference to the pathology of the organ. I shall here merely describe briefly the vascular structure of the kidney, and the relation of the vessels to the urinary tubules or minute excretory ducts, assuming that the larger tubular arrangement, constituting the internal parts of the kidney—viz. the cones or pyramids, the mammillary processes, infundibula, and pelvis—is familiar to the reader.

When the smaller urinary tubes are traced up into the cortical portion of the kidney, they may be observed, with the assistance of the microscope, taking an extremely tortuous course. They eventually communicate with the vascular tufts known as the Malpighian bodies, and which are made up of masses of arterial capillaries. The accompanying sketch will serve to show the manner in which this junction takes place, and also the plexiform arrangement by which the blood is carried away from the Malpighian bodies after the process of secretion has been carried out.



(Magnified forty diameters, after Bowman.)

a, The artery giving off a terminal twig to the Malpighian body *m*. *d*, Efferent or portal vessels joining the capillary plexus of veins. *e e e*, Other efferent vessels. *t*, Uriniferous tube. *g*, Branch of emulgent vein. *b*, Infundibuliform enlargement of the urinary tubule continued so as completely to surround the Malpighian body.

The above description and sketch is in accordance with the observations of Mr. Bowman. The cortical portion of the kidney must, then, be regarded as made up of multitudes of these Malpighian bodies, accompanied by their vessels and excretory urinary tubules. The urinary tubules and the infundibuliform enlargement embracing the Malpighian bodies are both composed of two distinct structures—viz. a basement membrane and epithelium. The former of these does not differ materially from the same structure in other parts of the system, excepting that it is here of extreme tenuity: it forms the outline of the tube, and the epithelium is attached to its inner wall: it is elastic, and does not exceed 1-20,000th of an inch in thickness, according to Mr. Bowman. The epithelium lining the tubes differs materially in character, according to position: thus, that immediately in contact with the infundibuliform expansion of the tube, or capsule embracing the Malpighian body, is of remarkable tenuity and transparency. As we proceed, however, along the tube away from the Malpighian tuft, the epithelium scales gradually assume a firmer and more marked character, becoming thicker, nucleated, granular, and rounded in form: they cover the basement membrane completely.

As regards the Malpighian bodies, they may be viewed as composed of globular masses of blood-vessels enclosed in the expanded extremity of a urinary tubule. The blood, after the secretion of urine has taken place, is returned by a vein corresponding to the main arterial branch entering the capsule. This vein does not, it will be observed, return its blood to the emulgent vein directly, but, as is seen in the woodcut, first communicates with a plexus of veins surrounding the uriniferous tubes, which plexus eventually becomes continuous with the branches of the emulgent vein.

The above short notice of the healthy anatomy of the kidney will enable the reader perfectly to understand the rationale of a view which has been taken of those pathological conditions of the kidney which it is the object of the present work to describe.

The part of the kidney into which the foreign matter is deposited, causing the granulated or mottled appearance in the kidney, was first more particularly pointed out by Dr. Johnson.* In that paper the author states that the epithelium lining the urinary tubules contains a certain portion of oil in the healthy state; and that during the progress of the disease this oil increases in quantity, so that the Morbus Brightii is, to use this author's words, "primarily and essentially an exaggeration of the fatty matter which exists naturally in small quantities in the epithelial cells of the healthy organ." This author does not consider, however, that all granular kidneys are necessarily fatty. He wishes, however, that the term "Morbus Brightii" should be restricted to such cases.

Some very interesting results are quoted in the above paper in reference to the production of fatty degeneration of the kidney in animals by Mr. Simon. That gentleman, while experimenting on the artificial production of scrofula, confined a cat in a dark cellar for six weeks. This cat's kidneys were found on examination to exhibit a mottled appearance, and the tubes of the cortical portion were filled with fat. The liver also contained fat in large quantity. Two other cats were subsequently treated in a similar manner, and their urine submitted to microscopical examination by Dr. Johnson and Mr. Simon. They found the urine of one animal became at first loaded with fat, and on this gradually disappearing the urine contained albumen, which was not the case when the fat was present in quantity. The urine of the second cat gave similar indications, the albuminous condition being accompanied by the presence of inflammatory products, the result of disease of the mucous membrane of the bladder. The kidneys in this second case, as well as the liver, were extremely fatty.

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* Medico-Chirurgical Transactions, vol. xxix.

Subsequently to the publication of the paper by Dr. Johnson, Mr. Busk communicated a paper to the Medico-Chirurgical Society, in which he took occasion to state that the examination of a great number of kidneys had led him to conclude that adhesive inflammation of the tubuli uriniferi and venous plexus of the kidney was "by far the most frequent cause of chronic albuminuria, and what is termed granular degeneration of the kidney." Mr. Busk also states it to be his opinion that though oil frequently exists in the tubuli uriniferi, its presence must not be regarded as having any direct or necessary influence in the production of albuminuria, since that condition is not brought about in some cases of jaundice characterised by a fatty condition of the kidney; and, moreover, that albuminuria may exist without any fatty degeneration being discernible. It is necessary here, however, to remind the reader that Dr. Johnson admits that other conditions than that of the fatty form of degeneration may produce albuminuria: and in the 30th vol. of the Medico-Chirurgical Transactions, we have his views explained under four heads, as follows:—1st. Acute desquamative nephritis. 2d. Chronic desquamative nephritis. 3d. Simple fatty degeneration. 4th. A combination of fatty degeneration with desquamative nephritis.

Desquamative nephritis, in its acute form, is, according to this author, the diseased condition observed in the albuminuria attendant on scarlatina. It occurs also as an idiopathic affection, and goes on to a chronic condition, producing all the evils attendant on the Morbus Brightii.

This subject is argued in its general bearings in a paper by Mr. Simon,* who attempts, at some length, to reduce the question to philosophical order. He would wish that the morbid condition characterising the large mottled kidney, and produced by fatty deposit, should be regarded as allied in character to the phthisical and scrofulous degeneration; while the contracted and atrophied kidney should be considered as the result of morbid actions belonging to the category of blood diseases,—gout, rheumatism, &c. This view is, to a certain extent, valuable. It is necessary, however, to state in reference to it, that enlarged mottled kidneys are not always produced by fatty degeneration; a fact I have proved beyond doubt by chemical analysis, which lately showed such a kidney to contain less fatty matter than the organ in health, notwithstanding that the patient sunk from the chronic disease. This kidney appeared fatty to the naked eye, and was sent me as a fatty specimen.

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* Medico-Chirurgical Transactions, vol. xxx.

Let us now consider the nature of the evidence we possess in respect to the question of fatty degeneration; and firstly, as to the proof adduced that that which has been viewed as fat is really so. The more exact value of the sight as a means of ascertaining or determining the true nature of substances when unassisted by the other senses, is scarcely to be properly appreciated by those unaccustomed to chemical inquiry. The extreme imperfection, however, of this sense when it is applied alone to judge of the nature of a *mass* of deposit in an organ or in the urine, of which the *surface* only can be presented for observation, must be sufficiently obvious to all who consider the question for a moment; for that surface, from having been subjected to contact with other substances, and also, perhaps, to attrition and other actions, will of necessity be an imperfect indicator of that which is beneath it.

Let us assume that every thing which has an oily or fatty appearance is oil or fat, an assertion which very few will be inclined to hazard; and let us suppose a solid mass presented for examination, which we are not allowed to feel, smell, cut, crush, or divide,—should we be justified under such circumstances in declaring more than that the *surface* was *oily?* This mode of judging by sight alone might possibly have determined muscle as made up of fat; and it would only have been because such observers had the opportunity of feeling, washing, and chemically treating that structure, that it would have escaped classification as a fatty substance.

It may be naturally asked, how are we then to determine the nature of a microscopic specimen, and ascertain whether sight deceives us as to its fatty or oily nature? Here, where mechanical methods of examination are no longer applicable, we fortunately are assisted by chemistry; and by the use of a menstruum capable of dissolving fat, we have an opportunity afforded us of examining our microscopic specimen both before and after its application, and so observing whether or not it has been acted on by it. This menstruum is ether, and if after its application the mass be found to have disappeared, it most likely was all fat; while if its general appearance have become altered, then fat was a constituent. If, however, it remains unchanged, then we may conclude that we have been altogether deceived by our sight. I have satisfactorily determined by this test that some forms of degenerate kidney showing a fatty appearance really contain an excess of fatty matter; though the contrary is certainly quite as frequently the case.

I am by no means satisfied of the correctness of the analogy drawn between this fatty degeneration and that occurring in fatty liver, for the reason that, judging from the proportion of fat contained in such kidneys, they most decidedly assimilate rather to organs suffering from scrofulous deposit than from true fatty degeneration. Strumous deposits are fatty, sometimes sufficiently so to deceive the sense of sight into a belief that they are entirely composed of fat; and the microscopic oily particles contained in the tubules of the cortical substance, and occasionally found attached to the casts of the tubules thrown off in the urine, may be regarded as necessary consequences of the existence of strumous matter in the organ. Tubercular matter in the abdomen has been found to contain 25·4 parts of fat in 106·18 of its solid matters. Scirrhus, hard as it is, has been shown by chemists to contain 10 per cent. of fat in its solids; and with these considerations I will now give the results of three analyses which I made with a view of throwing light on this question, and in order to institute a comparison between the healthy and diseased organs. The following analyses were made precisely on the same plan:—

	1. Health.	2. Enlarged greyish oily-looking kidney.	3. Enlarged kidney, considered probably fatty.
Water . . .	74·83	81·277	82·27
Fatty matter .	1·86	2·902	0·50
Urea	a trace	0·145	a trace
Other solids . .	23·30	15·676	17·23

The specimen which served for the first analysis here given was obtained from a man who died a violent death. The organ had the appearance of health in every respect. The specimen on which the second analysis was performed was prominently marked by the fatty character. The third specimen was sent me by a gentleman who considered it a fatty kidney: it was certainly greasy on the surface; it proved, however, to contain less fatty matter than the healthy organ, and was one of those kidneys which had probably been affected by the adhesive character of inflammation, and infiltrated with its products.*

As regards the comparison between the analysis of the healthy specimen and that containing an excess of fat, the relative proportion of fat shown certainly goes to favour the view before stated, that strumous matter containing fat as a constituent had infiltrated the organ, rather than that the disease possessed the character of true fatty degeneration.

The increase in the proportion of fatty matter natural to the epithelium of the uriniferous tubules, produces, according to Dr. Johnson, a congested state of the kidney in the following manner. By the distension of these tubules, the capillary plexus of veins surrounding them becomes pressed upon—a view easily understood by reference to the diagram of the healthy anatomy of the organ. An obstruction is in this way afforded to the return of blood from the corpora Malpighiana, and a congested state of the kidney is eventually brought about.

Dr. Gairdner is opposed to this view, and believes that, even admitting the existence of the mechanical condition described, we ought to regard it as a cause rather for the production of an anæmiated state of the kidney, than as competent to the production of congestion. He argues, however, principally upon the fact that the various post-mortem appearances shown have all more or less indicated an anæmiated character of disease. The uniformly pale or bloodless condition of the cortical substance, as shown in the plates published by Dr. Bright, is quoted in proof of this. Dr. Gairdner also alludes to the important fact that in complete and confirmed fatty degeneration of the kidney, the vessels are not full, but, on the contrary, in a state approaching depletion. It is certainly most true that the great change noticed in kidneys affected by deposit, whatever form that deposit may assume, is that which would appear to result from such deposit having interfered with the arterial supply of blood to the part. This is, indeed, almost an universal rule, if we except some of the congested forms of kidney which have been regarded rather as the preliminary stage to degeneration. According to Dr. Johnson's view, deposit is the cause of congestion, and should therefore precede it. It is not to be supposed, however, that other causes for congestion are correctly to be excluded from this consideration, and the simple congested kidney described by Bright is probably otherwise explained by Dr. Johnson.

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* The deposit of white material in the cortical portion of the kidney (acute desquamative nephritis), as described by Dr. Johnson; vide Medico-Chirurgical Transactions, vol. xxx.

On the whole, it is, I think, now pretty certainly established that by far the greater number of cases of kidney disease connected with albuminous urine are the results of inflammation, probably of an adhesive character, affecting the organ, and causing deposit in its substance,—a state which may or may not be followed by contraction, and that the rarer form of disease is that in which the kidney is infiltrated with tubercular matter containing fat as a constituent. That congestion may in some cases precede or even accompany this cachectic deposit is very probable, its analogy with tubercular disease of other organs, especially the lungs, becoming thus more complete; but it is scarcely probable that congestion is a necessary antecedent to all chronic forms of the disease.

With regard to the presence of fat in the urine of patients suffering from albuminuria, it occurred to me a short time ago to examine the urine of such a patient, in which I observed many corpuscles having the appearance of fatty matter. Ether extracted traces of fat from the specimen, and I watched anxiously for the result of the case in order if possible to observe whether or not this was a kidney showing the fatty degeneration. On examining the organs after death, however, instead of such a condition of kidney, I found indurated and somewhat contracted kidneys, infiltrated by hard, white deposit,—a diseased condition not uncommonly observed in persons of gouty diathesis, of which this patient was the subject. The presence of fatty matter in the urine was in all probability accidental to the kidney disease, and connected, perhaps, with lesion of the liver, and interference with its functions.

GENERAL HISTORY OF ALBUMINOUS URINE.

Having now described the various diseased conditions of kidney which exist in connection with a discharge of albumen by the urine, I will proceed to consider the more exact value of the presence of albumen in that excretion, as a guide by which to ascertain the existence of kidney disease.

According to the statement of some writers, albumen so frequently appears in the urine, and under conditions of body so slightly varying from health, that its presence or absence would appear to be a matter of little consequence. The fallacy of such a view is at once made apparent, however, to all who choose to inquire practically into the subject; and I shall hereafter proceed to notice some of the loose statements which have been made on this point, and, as I hope, to prove to the reader that the presence of albumen in the urine, taken together with other facts easily to be ascertained in kidney disease, is a very sure guide to the determination of such lesion; and that the indication, even taken alone, must be regarded as one of the most valuable and certain among the signs afforded for the guidance of the practitioner.

I do not here speak of albumen as poured out with red corpuscles and fibrin, in the form of blood, but of the principle as it exists dissolved in the urine, and unaccompanied by fibrin or corpuscles.

The conditions under which albumen may be found in the urine, independently of the existence of those lesions of kidney recognised under the head of "Bright's disease," may be stated as follows :—

1. During the last hours of life it would appear that albumen is to be detected in the urine of persons dying from diseases quite unconnected with lesion of the kidneys. When the organism is undergoing the changes preceding the extinction of vital power, there appears a general tendency to permit the passive effusion of the serous parts of the blood into the tissues generally, and especially into the cavities of the body. The tubuli uriniferi suffering in this way (and perhaps even the bladder itself) thus afford a cause for the presence of albumen in the urine when no especial precedent lesion of the kidney has existed. It is not right, therefore, under such conditions, to lay much stress on the detection of albumen in the urine as indicative of nephritic disease.

2. When any cause of obstruction exists to the passage of the blood through the great system of vessels in any part of its course,—as happens when the heart has become implicated in severe disease, or when morbid growths or other deposits may press on the inferior cava, and when, owing to the difficulty opposed to the return of blood to the right ventricle, the lower extremity and inferior parts of the trunk become œdematous,—then it is obvious the kidney may become greatly congested: a state which we know is highly favourable to the effusion of serum into the urine.

It would certainly appear to have happened, though the instances are rare, that under the above condition albumen has been detected in the urine during life, while post-mortem examination has failed to show disease of the kidneys. On the other hand, it must be borne in mind that such general œdema of the lower extremities and other parts, caused by obstruction to the return of blood, may exist in a very prominent degree, and for a length of time, without the urine becoming impregnated with albumen; and on the whole we must regard the kidney as only to be very difficultly affected by the conditions described. It is extraordinary to observe to what an extent this immunity from serous admixture with the urine will pertain when the kidney is suffering merely from congestion, without being further diseased. Therefore, though the above may be an occasional cause for the presence of albumen in the urine independent of lesion of the kidneys, we must regard it as one but rarely met with.

3. When blood exists in the urine, owing to the accidental rupture of a vessel in the kidney, the existence of a calculus, or any cause productive of hæmaturia, we of course shall find albumen present. It is, however, not to urine containing blood that we are now more especially directing attention; and no conclusion as to the presence of kidney disease is ever to be drawn until we have the opportunity of observing whether the secretion is free from albumen or not after the red particles have ceased to appear.

4. When pus exists in the urine we must not draw any conclusion from the presence of albumen. The serous part of the pus diffuses itself in the urine, while

the corpuscles subside, and this albumen may be detected in solution. It is important to be aware of this, and to wait till the pus may possibly disappear from the urine before examining with a view to the presence of kidney disease. If the pus be from the kidney, however, and not from the bladder, as is sometimes observed in albuminous nephritis, we need scarcely expect the presence of any of the forms of diseased kidney which have been arranged under the generic title of "Morbus Brightii."

The chief importance of being aware of this source of fallacy is in its connection with those cases of calculus in the bladder in which pus is excreted with the urine. The exact condition of the kidneys, as to their excreting albumen or not, cannot then be satisfactorily ascertained. In, such cases if we can so relieve the symptoms as to do away with the discharge of pus from the lining membrane of the bladder, we may then assure ourselves as to the secretion of albumen or not by the kidney, and so determine an important fact for the surgeon, who must be influenced not only in respect to operating, but more especially in his prognosis, by this important element in the consideration.

5. The presence of semen is sometimes a cause for the existence of albumen in the urine. This, however, is a rare source of fallacy, and the albumen present is generally but small in quantity. I understand, however, that this fallacy has really deceived an observer into a belief that the patient was the subject of kidney

disease. The microscopical examination of this description of urine will, however, at once settle the question by determining the presence of the seminal animalcula in the deposit.

6th. It is necessary here to mention, as part of the history of the subject, that the urine first passed by patients recovering from Asiatic cholera contains albumen.

The following causes have been stated as sufficient to produce albumen in the urine *independently of the presence of kidney disease ;* but careful observation has shown that they are not to be regarded as sources of fallacy to those who correctly understand how to examine for albumen.

1. Dyspepsia has been commonly stated to cause albuminous urine. This I have never seen, though I have frequently requested those who have made the statement to favour me with a specimen. Cheese or milk diet, and pastry, have also erroneously had the credit of producing an albuminous condition of the urine.

2. A full meal of animal food has been supposed to produce albuminous urine. This, as well as the first described error, probably arose from the fact that both dyspeptic urine, and urine passed after a full meal, will

very often become clouded by heat, owing to the deposition of phosphate of lime: an appearance which has led the observer to conclude that albumen was present.

3. Mercury exhibited freely has been regarded by some as a cause for albuminous urine. This is not the case, so far as I have been able to make out, after some labour on the subject.

I extract the following remarks in reference to this subject from the Guy's Hospital Reports, No. 12, 1841; and must add that I am now quite satisfied that mercury will not cause albuminous urine:—

"I was very anxious to put this to the test; and accordingly formed the plan of a table, which my friend Mr. D. Francis* (who has attended very much to the examination of diseased urine, and for whose accuracy and judgment I can vouch) kindly undertook to fill up with observations on those patients admitted into the hospital, who would probably be subjected to salivation. The urine of these patients was tested when salivation was complete, and, in some cases, before the administration of the remedy; the latter being necessary, to exclude cases of true Morbus Brightii, which would interfere with the inquiry.

I have great pleasure in being able here to quote the following results of Mr. Francis's labours:—

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* Now Dr. Francis.

No.	Name, Date, and Disease.	Action on Litmus & Turmeric.	Effects of Heat.	Effects of Nitric Acid.	S. G.	State of Gums.	Observations.
1.	Benjamin Neale. Dec. 18. 14 Samaritan. Syphilis.	Acid	No change	No change	1016	Gums fairly affected : fœtor : saliva increased	Urine was not examined previous to administering of mercury.
2.	John Hart. Dec. 18. 30 Samaritan. Syphilis.	Acid	No change	No change		Mouth not affected	
	Jan. 2.	Acid	Lithates dissolved	No change	1022	Gums sore and turgid : fœtor	
3.	Edward May. Dec. 18. 32 Samaritan. Syphilis.	Acid	No change	No change		Mouth not affected	
	Jan. 6.	Acid	Slight precipitate	No change	1021	Teeth loose : gums very sore : fœtor : increased saliva	Precipitate by heat dispelled by nitric acid. Urine clear, copious, and natural in colour.
4.	Edward Ford. Dec. 18. 18 Samaritan. Syphilis.	Acid	No change	No change		Mouth not affected	
	Jan. 6.	Acid	No change	No change	1004	Teeth loose : gums sore	Urine very copious, clear, & limpid.
5.	Edward Bryant. Dec. 18. 9 Samaritan. Syphilis.	Acid	No change	No change		Mouth not affected	
	Jan. 4.	Acid	No change	No change	1024	Gums ulcerated : teeth loose	Urine natural in quantity and colour, and clear.
6.	Mary Hart. Jan. 9. 2 Ruth. Wound of the eye.	Acid	No change	No change	1009	Gums turgid and aphthous : teeth loose : fœtor	Urine copious and limpid : not examined previous to administering mercury. Saliva slightly reddened litmus.
7.	Celia Everett. Jan. 15.	Acid	No change	No change	1006	Face and glands beneath the jaw	Urine rather copious : not exa-

8.	Jan. 15. Naaman. Cerebral disease.	Acid	No change	No change	1016	Gums turgid and ulcerated : fœtor : face swollen	Urine natural in appearance : not examined previously to exhibition of mercury. Saliva neutral.
9.	Thomas Wells. Jan. 9. 35 Samaritan. Syphilis.	Acid	No change	No change	1018	Gums not sore	
	Jan. 22.	Acid	No change	No change	1010	Gums turgid : teeth loose : fœtor	Urine clear, pale, and copious. Saliva slightly acid.
10.	Alex. Kennedy. Jan. 9. 27 Samaritan. Syphilis.	Acid	No change	No change	1022	Gums not sore	
	Jan. 23.	Acid	Slight precipitate	No change	1020	Gums ulcerated : face swollen : upwards of a pint of saliva flowing from the mouth daily	Urine pale, natural quantity : precipitate by heat dispelled by addition of nitric acid. Saliva neutral.
11.	Elizabeth Gain. Feb. 24. 3 Petersham. Sequelæ of puerperal convulsions.	Acid	No change	No change	1020	Gums turgid and sore : glands of neck swelled : teeth loose	Saliva slightly acid.
12.	Harriet Willett. Feb. 24. 26 Dorcas.	Acid	Deposit dissolved : no subsequent change	No change	1016	Gums turgid : teeth loose : fœtor : sputa about half a pint a day	Saliva neutral.
13.	James Hawkes. Feb. 24. Samaritan. Syphilis.	Acid	No change	No change	1017	Gums turgid and ulcerated : teeth loose	
14.	Mary Grist. March 2. 13 Lydia. Acute bronchitis.	Acid	No change	No change	1013	Gums turgid : mercurial sores on lips	Urine pale and copious, free from deposit. Saliva slightly acid.
15.	Elizabeth Allen. March 3. 14 Lydia. Jaundice.	Acid	Deposit dissolved	No change	1030	Teeth loose : gums sore and turgid : fœtor	Urine scanty and loaded with deposit. Saliva neutral.

"From these observations we may safely conclude that mercury does not always produce albuminous urine: and though we cannot say, from these few instances, that it never is a cause of the existence of that principle in the excretion, yet these cases may serve to warn the reader from depending too much upon loose assertions. I have myself observed that urine containing albumen sometimes becomes freed from that substance by exhibiting mercury to the patient. Mr. Francis, during his late inquiries, met with such a case; and I quote the following from a note I received from him:—

"'The other case was one of albuminous urine. The patient was salivated: and whilst under the mercurial influence the albumen entirely disappeared.'"

TESTING THE URINE FOR ALBUMEN.

The presence of albumen in the urine being the chief and characteristic symptom to which attention is required in the class of diseases here treated of, it may be as well thus early to describe the method of detecting that principle in the urine, and to notice the various sources of fallacy which may be met with during the investigation.

The two principal tests used by practitioners in order to obtain indications of albumen in the urine are nitric acid (strong) and the application of a boiling temperature. Both these tests are subject to sources of fallacy; the precipitates obtained being in both cases occasionally simulated by other principles than albumen.

NITRIC ACID TEST.

1. When nitric acid is added to albuminous urine, a white precipitate is produced. There are some peculiarities about this reaction which it may be well to notice, inasmuch as I have known the test fail in the hands of the inexperienced, simple as its application may appear. It frequently happens that on the first addition of the acid the albumen is precipitated for a second or two, and is then redissolved. A further addition of acid causes a second precipitation, and perhaps again a resolution. After the addition, however, of a considerable quantity of acid, a permanent precipitate is afforded. Owing to ignorance of the above fact it has frequently happened that urine has been considered as unprecipitable by nitric acid ; the operator having examined it after the addition of a small quantity of the test, and not having watched the effect of the first addition of the acid, which should always be done by the best light that can be obtained. The cause of this difficulty in obtaining a permanent precipitate until a larger quantity of acid has been added, may perhaps consist in the fact that the nitric acid must always bear a certain proportion to the albumen present, in order to afford the insoluble combination ; a less quantity producing soluble compounds of the acid and albumen.

2. Some specimens of urine effervesce strongly on the addition of nitric acid. These, when they contain albumen, sometimes present a difficulty to its detection

which I have had more than once to notice. This effervescence is always produced when the acid is added to warm urine, and it is then the source of fallacy I am about to notice is most likely to arise. It consists in the fact that the bubbles as they ascend in the urine catch up the flocculi of albumen precipitated by the acid. The whole of the precipitate may thus be carried up and concealed in the froth, while the liquor below remains perfectly clear. When effervescence, therefore, is produced on the addition of the acid, it is right to wait till the froth has broken up before pronouncing an opinion; or the urine may be poured from the tube, and the froth adhering to the tube be broken down by the addition of water, when, if the albumen be contained in it, we shall see the flocculi floating. The above will show the propriety of not testing by nitric acid a specimen of urine which has been previously tested by heat, unless time first be given to allow of its becoming cold again.

3. Nitric acid may cause a white precipitate in urine when no albumen is present. This is the case when lithic acid (in the form of lithate) exists in large quantity in the secretion. I have observed this in cases of typhus fever of low type, and also in several cases of small-pox. This condition is probably more frequently present in disease than the profession suppose, and I believe has led to some of the strange notions concerning the frequent presence of albumen in the urine in typhus, &c., which have lately been promulgated on the continent. This precipitate of lithic acid

may be readily distinguished from that of albumen by testing a second portion by the addition of hydrochloric acid, which will precipitate the urine equally as well as the nitric, if the effect be owing to lithic acid; but will produce no reaction if albumen be the cause of the precipitate by nitric acid. It is unnecessary to mention, that this source of fallacy is not a common one, and may be expected to occur only when some marked symptoms are present having no relation to cases of albuminuria.

4. The urine of patients taking copaiba or cubebs will yield a white precipitate on the addition of nitric acid, which at first closely resembles albumen, and would be very likely to mislead those not very practised in these inquiries. The method of distinguishing this precipitate from that occasioned by albumen consists in allowing the tested liquor to remain at rest two or three hours; when, if albumen have caused the opacity, the whole of it will be found as a precipitate, the supernatant urine being quite clear. If, however, the opacity have been occasioned by the resinoid matter of copaiba or cubebs, the precipitate will not have subsided, the urine remaining milky for many hours, or even days. Another and more ready method of distinguishing these precipitates is by using a solution of ferrocyanuret of potassium as a test, previously acidulating the urine by acetic acid. If albumen be present it is thus immediately thrown down; but, in the other case, even if the acetic acid produce a slight turbidity, it will not be increased by the addition of the ferrocyanuret.

Urine impregnated with the resinoid matter of cubebs or copaiba usually possesses a strong odour of the drug; and this is generally sufficient to lead to suspicion. These specimens of urine are not precipitated by boiling.

TEST OF HEAT.

1. When albuminous urine is heated to about 160° Fahrenheit, the albumen begins to coagulate; and by continuing the heat the liquid becomes opaque, owing to the precipitation of flocculi. These, after a time, collect at the bottom in form of a precipitate. In order to obtain this reaction it is necessary that the urine be acid, which is generally the case. If, on the contrary, however, the urine be alkaline, the test of heat no longer avails us, as then even a prolonged heat will not throw down the albumen. This also happens in many neutral specimens; so that it is necessary to test the urine with red and blue litmus, before we can hope to arrive at a correct opinion by the application of heat, which can never yield a positive result unless the urine be acid. If alkaline urine be first carefully acidified by acetic acid we can then obtain a precipitate of albumen by heat.

2. When heat is applied to some specimens of urine which are quite free from albumen, we, notwithstanding, occasionally obtain a precipitate: and it is very important to be aware of this, as patients have often been regarded as the subjects of albuminuria owing to ignorance on this point.

The precipitate so obtained consists of phosphate of lime, which is often in sufficient quantity to simulate the albuminous precipitate.

It is necessary to remember that this precipitate may be obtained by boiling urine possessing either an acid or an alkaline reaction; mostly, however, such specimens are acid, and many of them become more acid after being boiled.

Generally speaking, this precipitate of phosphate of lime requires longer boiling than albumen, for its production. It is readily distinguished from albumen by being immediately re-dissolved on the addition of a drop of nitric acid, which has not that effect on the precipitate of albumen. These phosphatic precipitates, therefore, are not produced by the addition of nitric acid, as happens with albumen.

As regards the frequency of occurrence of that condition of urine which is precipitable by the application of heat, owing to the existence of phosphate of lime in excess, I may here state, that during experiments made at Guy's Hospital, we found that, out of 482 cases taken promiscuously from the hospital wards, thirty-four, or about seven per cent., were coagulable by heat, and *not* by nitric acid, and were therefore cases in which the phosphates caused the precipitate.

3. Though, as the general rule, all urine containing albumen will, *if acid*, yield a precipitate on the application of heat, yet there are exceptions observed even to this rule. Such exceptions are of *very* rare occurrence. It has happened to me, however, to see on two

occasions acid specimens of urine which would yield no precipitate of albumen on boiling, but from which albumen was precipitated by the addition of nitric acid.

It will be observed, after an attentive perusal of what I have stated in reference to the two tests of nitric acid and heat as applied to the detection of albumen in the urine, that the two if used together exclude nearly all the sources of fallacy described above. Thus, if a specimen of urine yield a precipitate both by nitric acid and by heat, we may be nearly sure that it is albumen that is thrown down; because, though nitric acid will precipitate lithic acid and the resinoid matter of copaiba, these are not precipitated by heat; and though heat will throw down the earthy phosphates, these will not be thrown down by nitric acid, which is the case with albumen. It may certainly happen (and, indeed, I once met with such a case) that a specimen of urine containing resinoid matter of copaiba may also contain an excess of phosphate of lime. In such an instance we should find a precipitate both by heat and nitric acid, even though no albumen were present; as the acid would throw down the vegetable matter of the copaiba, and the heat would throw down the phosphates. This condition may, however, at once be suspected, owing to the nature of the precipitate obtained by nitric acid, and which may be distinguished as I have described under the head of the nitric acid test.

There is a fluid test for albumen which possesses some advantages over nitric acid, more especially that of being more conveniently portable—viz. the acetic acid and a solution of the ferrocyanuret of potassium. If urine be first well acidulated by acetic acid, and then tested with the ferrocyanuret, we obtain a precipitate of albumen, if any be present. This test is quite as free from fallacy as nitric acid, but requires more care and judgment in its application; as, if too little acetic acid be added, we may fail to obtain any precipitate. In practised hands, however, this test is very convenient and satisfactory.

Other tests have been proposed for detecting albumen in the urine, but those above described will with care be found quite sufficient for the purpose. The other tests which have been proposed,—viz. alum, bichloride of mercury, and the mixed nitrates of mercury, are, moreover, very fallacious.

PATHOLOGY OF THE DISEASE.

The labours of Dr. Bright may perhaps be considered the first which brought the subject of diseases of the kidney prominently before the profession in connection with the existence of albumen in the urine. Previous observers, among whom Wells and Blackall take the first places, had regarded the existence of albumen in the urine rather in connection with dropsy; and it was indeed a most important step in advance when Dr. Bright's discoveries enabled him to treat the subject in its more general relations, and to show that we must regard dropsy merely as the most frequent symptom of a disease of the kidneys producing albuminous urine. Wells, it is true, had observed the existence of disease of the kidneys as connected with albuminous urine and dropsy; but it is to Dr. Bright's researches that we are indebted for establishing that which before had been imperfectly noticed, and for showing the true relation of the lesion of the kidneys to those varied and curious affections so frequently found complicating the disease.

From the description I have given of the morbid anatomy of the kidneys affected with disease competent to the production of albuminous urine, it may already be obvious to the reader that the general symptoms which arise during its invasion and progress must vary considerably, not only because the kidney may be the subject either of an acute or chronic inflammatory affection, but also for the reason that we may have engrafted upon the organ a disease of a more specific character, removed from ordinary inflammation, and probably bearing some relation to those affections producing the unorganisable deposits known under the general title of tubercular struma. It is thus that in a great many cases no well-marked acute stage of the disease is observed, the mischief creeping on insidiously, and perhaps altogether eluding the observation of the patient and the vigilance of the medical attendant. In other cases, however, well-marked inflammatory symptoms occur: these, if checked by proper treatment, will sometimes leave the patient perfectly cured. Unfortunately, however, the acute symptoms terminate more commonly

only in the supervention of chronic disease of a most dangerous character.

There is much interest in considering the probable conditions which are induced when these important affections of the kidney are about to occur,—to reflect not only on what may be the first deviation from health, but to inquire into the cause of that deviation, and how far we are entitled to regard the blood as originally affected, and its abnormal condition, as the first fact in the train of causation for the production of unhealthy action. To this consideration, which has some bearing on the production of disease generally, we hear it occasionally objected that the blood, flowing as it does through all the organs, might be expected, when diseased, to produce its bad effects throughout the system rather than to select any single organ for the purpose. The validity of this objection has never been apparent to my mind, for the reason that, knowing as we do that the blood in health, permeating the tissues of the various organs, causes the secretion of fluids differing essentially in character, we may feel assured that the conditions of those organs exert an important influence in bringing about the varying results. From this it is but to fair to deduce that the effect produced by the structure of the organs is an important element in considering the probable action of a diseased blood; and therefore it appears by no means an unjust conclusion that the blood when so diseased may not find the conditions pertaining in all the organs such as to favour the morbific influence, but that one organ in particular may do so, owing to its structure happening to bear a peculiar relation to the abnormal state of blood, and one which admits of the development of the mischief. If the blood be variously acted upon by the organised tissues in health, may we not expect some such relation to pertain in disease? However this may be, the arguing the question will scarcely repay us for our trouble, in the present state of our knowledge, and with our present means of inquiry. We must wait for a more extended pathology, and for other methods of investigation than those afforded by the unsatisfactory chemistry of the present day. Under this conviction, I shall dismiss the consideration of a part of the subject concerning which we have as yet no sufficient grounds for the formation of an opinion.

So far as our present knowledge extends, it is in the tissue of the kidney that we first trace the deviation from healthy action for the production of albuminuria. I have already described the various kinds of lesion observed in those organs, and shall now proceed to treat of the changes observed in the blood; the causes of many of which undoubtedly may be traced to the condition of the kidney.

STATE OF THE BLOOD.

The albumen existing in the urine passed by those suffering from this disease is derived immediately from the blood, and it is therefore obvious that the constitution of that fluid must be greatly modified early in the disease. The changes in the blood are not, however, confined to an alteration in the proportions of its natural ingredients ; for even in early stages of this disease we find urea can be shown, by analysis, to exist in the diseased blood, accompanied in all probability by other proximate animal elements natural only to the urine. The presence of urea in the blood is doubtless a result of retained secretion, the function of the kidneys being materially interfered with at the very commencement of the disease.

The most obvious, and probably the most important, morbid change produced in the blood, consists, however, in the loss of its albumen. This causes very important changes in its physical characters, the liquor sanguinis becoming watery, a condition which leads to a variety of secondary evils to be hereafter noticed. This deficiency of albumen in the blood is sometimes so marked that the serum, when examined, occasionally is found as low in specific gravity as 1018, or even 1015 ; the standard of health being about 1029 to 1031.

The proportion of red corpuscles does not appear to undergo any very marked change in the early stages of this disease, but is found at about the natural standard. As regards the proportion of fibrin, it is not necessarily changed. It has occasionally been noticed in excess in the early stage ; but, generally speaking, when no inflammatory complications exist, it will be found in about the normal proportion. When, however, we have inflammatory affections of important organs occurring, which is by no means unfrequently the case during the progress of this form of disease, then the blood becomes buffed, and shows all the indications generally observed in the course of such inflammations.

As the disease advances we find important changes effected in the blood. The discharge of albumen having continued, the red corpuscles have now decreased in proportion, and the patient has become anæmic. The quantity of albumen in the urine has now become less, and the liquor sanguinis more nearly approaches the natural standard. This is shown by the serum sometimes rising in specific gravity even to above its natural weight, while its proportion of albumen is increased. This, however, chiefly happens when albumen no longer appears in the urine,—a condition now and then observed in advanced cases. The fibrin is now occasionally in small excess, but generally, as before stated, does not materially vary from the natural proportion.

It is of some interest to consider how the gradual changes we observe to occur in the blood are brought about. The drain of albumen by the urine satisfactorily accounts for its absence in the serum, as shown by analysis; but it is not so easy to explain how the corpuscles subsequently become deficient, inasmuch as the disease is not characterised by the discharge of red corpuscles in any quantity, either by the urine or in any other way.

A puffy and anæmiated appearance characterises those affected with Bright's disease in the advanced stage; and I will now proceed to describe the theory on which I have attempted to explain the manner in which the deficiency of corpuscles is produced, regarding it as a consequence of the drain of albumen.*

On the following theory I believe we may explain every form of anæmia resulting from discharges containing albumen as a constituent: thus, the anæmia consequent on long-continued gonorrhœa and leucorrhœa belong to this category.

The facts on which this theory is founded are as follows:—

1. In health the corpuscle is supplied with nourishment by the chyle.

2. The chyle is of lower specific gravity than the liquor sanguinis in which the corpuscles float.

3. In the early stages of the Morbus Brightii, the specific gravity of the liquor sanguinis is greatly diminished.

Now in red blood of every kind the corpuscles float in a liquor which is of the same density as the fluid contained within them. This is a necessary result of the physical law of endosmosis, because the blood-corpuscle is a membranous vesicle, and if its contained liquor were by any chance to become for a moment either specifically lighter or heavier than the fluid in which the vesicle floated, endosmodic currents would immediately be set in motion through the membrane, and the result of such changes would be the eventual acquirement of a condition of stasis in which the fluid within and the fluid without the corpuscle would be found of the same specific gravity. Now the liquor sanguinis in which the corpuscles float, is of much higher specific gravity than the chyle; and when, therefore, that fluid comes in contact with the blood-corpuscles as it enters the venous system, it meets with these vesicles, which contain a fluid of higher specific gravity than itself, and consequently a considerable quantity of this lighter fluid passes through the coats of the vesicle. This change, which appears necessary to the maintenance of the healthy condition of the blood-corpuscle (inasmuch as it is the manner in which iron enters to assist in the formation of hæmatosine), cannot occur to its normal extent if the specific gravity of the liquor sanguinis be lessened so as to approach that of the chyle, because in such case there will be very little ferruginous matter passing into the corpuscle, and scarcely any at all if the liquor sanguinis is so degenerated as to be below the density of the chyle: for we must remember that, though in endosmosis there is always a reciprocal change, which causes the fluids placed on either side of the membrane to pass simultaneously, still the heavier passes to the lighter in a much less proportion. This is easily seen under the microscope. When thus a fluid of 1010 is added to blood, the corpuscles become swollen, whereas the same saline solution strengthened to 1060 or 1070 rapidly collapses them. It is thus, then, on the fact of endosmodic change not occurring to its normal extent, that, I believe, we may very fairly attribute the deficiency of red corpuscles in albuminuria; these important bodies not receiving their nutrition to the proper extent.

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* The reader is recommended to peruse the extracts from the Gulstonian Lectures, appended to the work, before continuing this part of the subject.

The following table, made up from the analyses reported by Franz Simon, comparing the diseased with the healthy blood, may be interesting to the reader, as showing the manner in which the blood is affected by the continued drain of albumen characterising the Morbus Brightii.

	Water.	Fibrin.	Corpuscles.	Solids of serum.
Health. . . .	775·7	3·8	137·1	83·4
Disease . .	808·3	3·0	133·9	54·8 (1)
	859·2	8·2	75·5	57·2 (2)
	855·5	4·5	42·7	97·3 (3)

(1). A man aged 55—1st stage of granulation; anasarca; urea in the blood.

(2). A man aged 44—1st stage, more advanced than No. 1; anasarca; *pneumonia;* urea in the blood.

(3). A man aged 23—Advanced granulation after scarlatina.

The above table will be found sufficiently in accordance with the statements previously made in respect to the constitution of the blood in this disease. It will be observed that no very marked variation occurs in the proportion of fibrin except where, as in Case (2), acute inflammation is found complicating the original disease.

It may be well to state here, as respects the existence of urea in the blood, that that principle has been detected by myself and others in the effusions which take place into the various serous cavities of the body. I have found most unequivocal evidence of its presence in peritoneal, pericardial, and pleural effusions, and also in the fluid of the arachnoid. I have also found it in the milk of a patient affected with this disease.

STATE OF THE URINE.

The urine secreted in the course of this disease varies greatly both in quality and quantity. Most persons are aware that it is often characterised by a very low specific gravity, and that this indication is always considered as unfavourable in prognosis. This anxiety is felt, for the reason that a low specific gravity is characteristic of the advanced stages of the Morbus Brightii. In the early stages of the disease there is generally but little deviation from the natural standard, either in the quantity of urine excreted, or its specific gravity. This must be regarded as the general rule, to which, indeed, there are exceptions of not very unfrequent occurrence, and which show the quantity of urine discharged to have been less than the healthy proportion, rather than that any change in specific gravity has taken place. Thus, the specific gravity of urine in recent cases is rarely lower than 1017. As regards the quantity of urine passed during twenty-four hours, it may be regarded as about natural, namely, from thirty-five to fifty ounces a day, or, if anything, rather below than above this; for, when any variation does occur in the quantity of urine voided in early stages of albuminuria, we shall generally find it to consist in a diminution rather than an increase; and, indeed, we sometimes meet with cases in which either total suppression is observed, or only a few ounces are excreted during the day. In early stages of the disease the urine is occasionally voided of a blood-red or dark-green colour,—an alteration owing in both cases to the presence of blood. This admixture of blood, however, is in no way to be considered as a necessary symptom of the Morbus Brightii.

As the granular degeneration of the kidney advances, we find very great changes occurring in the quality of the urine. Thus, a tendency to an increased discharge of water from the kidney is observed, and the quantity of urine, so far from having a tendency to pass below the natural standard, frequently amounts, during the twenty-four hours, to double the normal quantity or more; from 90 to 140 ounces sometimes being excreted, while the specific gravity is greatly decreased, varying from 1014 to 1004. Now, this decrease of specific gravity is not merely brought about by a large quantity of water passing through the kidney, and so diluting the urine, for it has been observed in cases where the urine excreted during the twenty-four hours scarcely exceeded the natural quantity. This being the case, it is obvious that the solid matters passing through the kidneys for the depuration of the blood are in less than healthy proportion, while water is occasionally in excess. A little reflection will suffice to show the reason for this. The blood, you are aware, contains an excess of water in these advanced cases of albuminuria, and a great deficiency of solid matters; and, therefore, the blood has less solids to pour from its mass for the purpose of depuration. This reasoning, too, applies to some cases of the early stage in which the same deficiency of solids evacuated during the twenty-fours is observed. As regards the constitution of the urine, it is worthy of remark, that even the presence of albumen, which exists generally as a symptom in every stage of the Morbus Brightii, and is its principal characteristic, is not universally present; and even in confirmed cases, and those, too, in the advanced stages of the affection, we occasionally observe it absent for weeks together.

It is, indeed, for the most part, in the advanced cases that the albumen will disappear for a period; and very frequently, when it does not entirely disappear, it is present only in very small quantity. It is chiefly in early cases that albumen appears in very large proportion,—a fact which it is extremely important to remember in connection with this subject.

From the examination of the urine of cases which have occurred in Guy's Hospital, I have been able satisfactorily to show that lithic acid is sometimes absent from the urine in albuminuria, and that when present its proportion is sometimes much diminished. It occasionally, however, is present in excess, and then it is found as a sediment.

The quantity of urea excreted is very deficient: the analysis of the urine of these patients showing this in a very marked degree. Thus, in a case I examined in which the specific gravity was 1015, only eighteen fluid ounces were passed during the twenty-four hours; and the proportion of urea per 1000 was only 8·1, instead of amounting to from 20 to 25 per 1000, which would be about the normal quantity for urine of that specific gravity. Here, then, we had only eighteen fluid ounces passed in twenty-four hours, whereas from forty to fifty is the standard of health. The specific gravity was 1015, instead of the solid contents bringing it up to 1022, while the urea only amounted to 8·1 per 1000, whereas healthy urine at 1022 contains 30·1 of urea. The salts are also deficient in albuminous urine. In respect to the specific gravity of this kind of urine, regarding it as an indication of the amount of depuration going on in the blood in this disease, we must not forget to take into account the fact that the specific gravity is in part kept up by the quantity of albumen contained in the urine, so that even the low specific gravity noticed would indicate more depuration than is in reality taking place. This fact is deserving of great attention, since as much as five grains of albumen have been found in a fluid ounce.

Albuminous urine puts on a great variety of appearances; the principal of these are as follows:—

1. Clear, pale straw-coloured, as in health.
2. Clear, of a straw colour, paler than in health.
3. Dusky or smoky, as seen both by transmitted and reflected light.

4. Dark greenish, resembling somewhat the colour of porter.
5. Blood-coloured.

(All deposit having been allowed to collect at the bottom of the containing vessels.)

The two first varieties are those in which we can generally detect the greatest quantity of albumen. The urine No. 1, when excreted in the early stage of the disease, will sometimes become nearly solid when boiled; and the same thing occasionally happens in the case of No. 3. Nos. 4 and 5 both contain blood; the latter in largest quantity. There is a deposit in No. 4 of a dark-brown colour, which consists of corpuscles, with their contained hæmatosine changed from red to brown or dark-green, owing to some chemical action not as yet well explained. The urine No. 5 is generally observed in the early stages of the disease.

According to the stage and the nature of the disease affecting the kidney, we find various appearances in the deposit existing in albuminous urine. The material of these deposits may be excreted with almost any of the varieties of urine above described. Thus all the urines may be thick before they are allowed to stand in order to deposit the lithate of ammonia which is occasionally present. We may at once ascertain that the cloudiness of the urine produced when the deposit is shaken up in it is owing to the presence of lithate of ammonia, by applying heat as a test, when the whole of the deposit disappears. By continuing the heat in these cases, we may now observe the urine to become opaque again, owing to the precipitation of albumen.

The lithic acid in its various forms is often to be seen as a deposit; and when the urine happens to be alkaline, we may occasionally observe the triple phosphate. The crystalline lithic acid is not a very uncommon deposit in this disease.

There is no good reason to doubt but that nearly all the urinary deposits with which we are acquainted may occasionally be detected in albuminous urine; but the above are those most commonly met with.

Besides these matters which are precipitated from the urine, and which are more especially considered urinary deposits, we can observe, by the aid of the microscope, a number of more or less organised bodies, which are to be considered as more characteristic of the condition of the kidney. These consist of blood-corpuscles, of epithelium scales of two kinds, of mucus-corpuscles, and of hollow cylinders or tubes studded with spheroidal epithelium, and which are now generally recognised as casts of the smaller uriniferous tubes from the neighbourhood of the corpora Malpighiana. The spheroidal epithelium is peculiar to these smaller tubes or tubules. The other form of epithelium seen in these urines is the ordinary flattened kind, and comes from the vicinity of the larger uriniferous tubes constituting the cones or pyramids. The blood-corpuscles observed in the deposits are occasionally much swollen, owing to the endosmodic action of the urine. In other cases they appear ragged, and partially disintegrated, as seen under the microscope.

It is in the smoky urine (No. 3) that we observe the casts of tubes and the epithelium in largest quantity; but even when the clear varieties of urine are passed, if we allow them to stand and deposit, and then pour off the clear fluid, and use that at the bottom of the vessel for microscopic observation, we may constantly detect these bodies in abundance.

I have now to notice a fact to which considerable importance has been attached by some observers: I allude to the presence of oil-globules in the urine as indicative of a fatty degeneration of the kidney I have already described my view concerning the deposit of fat in that organ, and will now proceed to consider what importance we ought to attach to the presence of oil-globules in the urine.

In the first place I have seen them so excreted in a case of diseased kidney bearing no relation whatever either to a fatty or scrofulous degeneration of the organ, but in which post-mortem examination showed the kidney to be indurated and somewhat contracted. In this case the presence of the oily matter in the urine was in all probability owing to a vicarious action on the part of the kidney, as mentioned by Mr. Busk,* which induces the organ to eliminate carbonaceous elements naturally the products of the hepatic function.

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* Medico-Chirurgical Transactions, vol. xxix. 1846.

I cannot satisfy myself that oily matter, as has been stated, is frequently to be found in the urine in Bright's disease. I have often sought for it in vain; and in nine consecutive cases of albuminuria lately taken from the wards of the hospital, in which I carefully examined the urine with this particular object in view, I failed to detect the least trace of oil. On the whole, I am inclined to believe that, when that substance is present, it is rather as a concomitant, and its excretion by no means necessarily connected with any form of kidney disease.

The epithelium which we see in albuminous urine, when carefully examined by the microscope, may, it is true, be often found fatty in appearance. When this is the case, I think that the fact should be considered as rather pointing to the existence of those kinds of change in the kidney which I have described as allied to tubercular scrofula; and that, could we satisfactorily examine the deposit in the epithelium, we should find that albuminous and other matters, as well as oil or fat, entered largely into its composition.

SYMPTOMS AND DIAGNOSIS.

From what has gone before, the reader may possibly now expect that we are acquainted with more than one train of symptoms in connection with albuminuria—symptoms characteristic on the one hand of that form of disease yielding the hard and often contracted kidney; and on the other, of the change of structure before noticed as allied to tubercular scrofula.

It so happens, however, that our knowledge on this subject is far from perfect; for though there are cases in which we are able to diagnosticate with considerable accuracy, this advantage is derived rather from previous history than from symptoms. Thus when the subject is young, and no history can be traced of a former attack, or where in such a patient albuminous urine exists as a sequela to scarlatina, we may be able to form a correct opinion. In the great majority of cases, however, we shall find that no symptoms or history of a previous attack can be obtained, though post-mortem examination shows evidence of old and severe disease of the kidney. These insidious cases, which creep on slowly yet certainly, and which appear never to show acute symptoms in any early part of their course, form, I am inclined to believe, the great majority of cases of albuminuria.

The acute symptoms, then, which are observed either at the commencement of the disease, or which occasionally occur during its progress, do not show any such peculiarity in different cases as to enable us to decide what peculiar form of degeneration is affecting the kidney.

We are indebted to my friend Dr. Todd for some excellent observations on the gouty form of the disease causing albuminuria, an affection which tends to the production of the hard and contracted kidney, as distinguished from those more nearly allied to scrofulous degeneration. In gouty cases, then, we can also occasionally make a shrewd guess as to the condition of kidney we may expect to find after death.

The acute symptoms observed at the commencement of albuminuria, or during its progress, are as follows :—Febrile heat, pain in the head, dry skin, thirst, loss of appetite, urine scanty and albuminous, frequent desire to pass urine, pain in the loins and lower extremities, urine occasionally bloody ; nausea is very often felt, and vomiting sometimes occurs. These symptoms may continue for several days without any œdema being observed. It seldom happens, however, that more than six-and-thirty or forty-eight hours pass without decided dropsical swelling attracting attention. As regards œdema, it is worthy of attention that we may frequently have the eyelids and face swelled, without any such condition of the trunk or extremities. This swelling of the face alone is a peculiarity which often serves as a guide to the true nature of the case, when the other general symptoms characteristic of the disease are but imperfectly developed. If the acute symptoms above described are not engrafted on any old disease of the kidneys, and receive timely and proper treatment, the patient may completely recover ; the albumen no longer exist in the urine, and the disease may never return. Every one, at least, who has seen much of albuminuria, must be aware of cases which have occurred in persons from whom the disease has passed away, and who have enjoyed uninterrupted health for years. Dr. Bright (even at an early date in the history of his discoveries) was well aware of this; and I am particularly anxious to draw attention to the point, inasmuch as there appears to have been some misapprehension on the subject among the profession.

If, instead of the above-described fortunate result being brought about, the case goes on, and the chronic form of the disease be established, our patient must be regarded as the subject of one of the most severe and fatal maladies with which human nature can be afflicted. Unfortunately, in the great majority of patients that come under our notice suffering acute symptoms, we find this to be the case, and for the reason that the greater number we meet with are really the subjects of old and insidious disease, upon which the acute symptoms have become engrafted.

It would be a great boon to the profession could we discover some sure sign by which to determine in all cases whether the acute symptoms observed are connected with old disease or not; but this cannot be done, owing to the insidious manner in which the affection occasionally proceeds, causing only such trivial uneasiness to patients that they are unwilling to apply for medical advice. The prognosis of this disease is thus at times extremely embarrassed.

The symptoms which characterise the disease in the chronic form are much the same as those observed in the acute; they are, however, much less severe, and often trouble the patient so little as to be neglected. Thus it is that we are so often called in only when medical advice can be but of little avail; so far, at least, as respects permanent cure. In such cases, the patient complains of general uneasiness, dyspeptic symptoms, nausea, and perhaps occasional vomiting. The urine is passed frequently, while the face is pallid, and perhaps slightly œdematous under the eyes. This pallor of anæmia is generally very well marked. The œdematous state of the eyelids often disappears towards night, and is always most marked in the morning. In some of these slow insidious cases we have scarcely any anasarcous swelling. The legs may become puffed towards night, but even this does not always occur. From the above description it will be at once seen how easily these cases may not only be neglected by the patient, but their true character occasionally overlooked even by the medical attendant. When any marked amount of anasarca is present, then the disease is pretty certain to be detected; but unfortunately it is not so when anasarcous swelling does not exist, for the reason that many labour under the impression that anasarca is a necessary part of the disease, and recognise kidney affection only in connection with it, while, in fact, the kidneys may be diseased for months, without even œdema being produced, or only that tendency to puffiness of the ankles towards night which is observed in ordinary cachexia. It is very important to remember that anasarca is really nothing more than a symptom of the morbus Brightii. It is a very frequent symptom, it is true, but by no means always present, or a *necessary* one, even to the full development of the disease.

Whenever cases of debility, with tendency to nausea, present themselves to your notice, it is well to inquire into the state of the urine; and in such cases, if you also find that the patient complains of frequent desire to pass urine during the night (even though there be no pain in the loins, or anasarca anywhere), you will often find albumen in the urine, and all the symptoms of kidney disease may manifest themselves within no great length of time. There is a symptom occasionally observed in these cases to which I have been more than once indebted for detecting the real disease. It consists of a swelling of the wrists and occasionally of the forearm, not anasarcous, but combined with induration. There is no redness, but the parts are tender, while the patient suffers pains resembling neuralgia rather than rheumatism. In one case which came under my notice, there being no other symptom present indicative of the kidney disease, I was led to examine the urine from observing this swelling of the wrists, and found it highly coagulable, and the patient the subject of old kidney affection. The pallor of anæmia when seen in men must, however, be regarded as the most common indication, leading to the detection of this disease when more prominent symptoms are wanting. This anæmiated appearance, if combined with puffiness of the under eyelid, presents an aspect most significant to the practised eye. It indicates that stage of the disease at which the drain of albumen has begun to inflict further mischief on the circulatory fluid, by interfering with the production of the red corpuscles of the blood.

When young girls, at or soon after puberty, become the subjects of degeneration of the kidneys and albuminuria, the anæmia produced may be mistaken and treated for the ordinary anæmia of chlorosis. It is now some years since I first observed this fact among my out-patients at Guy's, and I have heard in other quarters of similar instances. The examination of the urine and the detection of albumen of course determines the question at once; but we need not be surprised that the probability of the anæmia depending on other causes than albuminuria is sufficient to satisfy the mind of the medical attendant in many such cases. A very remarkable instance of the kind occurred to me at Guy's, in the person of a young girl of 17 years of age, who I at first believed to be the subject of chlorotic anæmia, and it was only after seeing her several times that I was induced to make such inquiries as eventually showed the case to be one of disease of the kidney with albuminous urine.

There does not appear to be anything very distinctive in the colour or tint of the pallor of albuminuria. Some have considered it of a more dusky or a yellower colour than that seen in chlorotic anæmia. For my own part, I can see nothing positive in this respect. As regards yellowness of skin, we nearly always observe it present in advanced chlorosis, in which it sometimes will almost amount to the hue of jaundice; and as the case improves we can see this colour gradually give place to a death-like whiteness before the healthy flesh tint returns to the cheeks.

ANASARCA AND PASSIVE EFFUSIONS.

Notwithstanding that the anasarca so generally attending disease of the kidney connected with albuminuria must be looked upon as by far its most common and indeed almost constant accompaniment, still, as I have before stated, we must not regard it as a necessary symptom. My reason for specially insisting upon this is, that some of the worst and most rapidly fatal cases of the disease have occasionally been those in which no anasarca has been observed. In some cases also in which the brain has been early involved and death has ensued, anasarca has either been absent, or else has been a much less prominent symptom than in other cases which have terminated life only after a long continuance of the disease.

The attention of Dr. Bright was first directed to the inquiry which terminated in the discovery of the disease bearing his name, by the existence of anasarca; and it is remarkable how large a proportion of anasarcous cases are connected with kidney disease. Dr. Christison gives, as the result of his experience in Edinburgh, that three-fourths of the cases of anasarca are so caused. Forget, of Strasbourg, states the proportion at one-half. This estimate shews the great prevalence of kidney disease as productive of anasarca; but I am much inclined to think that it is present as a cause even more frequently than is stated by either of the above authorities.

There is a circumstance connected with the general history of anasarca to which Dr. Christison first directed attention, and which is certainly well deserving of attention. I allude to the statement that when that affection is accompanied with the excretion of a large quantity of water we may be almost certain that it is connected with disease of the kidney and albuminuria.

There is no doubt that we are often thus enabled to make a good guess as to the true nature of the disease. This increased flow, however, is not always present as a guide, and it is as to the presence or absence of albumen in the urine that we must inquire for more perfect information on which to form a diagnosis.

During the progress of the kidney disease, and more especially when anasarca is present to any considerable extent, we observe that the serous membranes, as well as the cellular tissue, become infiltrated with serum, and effusions of a passive character sometimes take place into them to a considerable extent. Ascites and pleuritic effusions are among those most commonly observed, and the pericardium may also become so involved. These effusions add greatly to the distress and anxiety of the patient, whose life is rendered doubly miserable, and is generally shortened, by the inconvenience arising from the mechanical pressure of the fluid.

It is not at all uncommon to find dyspnœa suddenly arising in these cases, perhaps during the night, and, on examination of the chest, to detect effusion to a great extent into one or both pleuræ, the patient having been previously quite free from such complication. Again, the patient may complain of great languor and oppression, and though the pleural cavities may not be loaded with effusion, careful exploration of the chest may show that effusion has taken place into the pericardium. These effusions, though they are extremely distressing, are not of an immediately dangerous character. The same cannot, however, be said of the watery effusion, as it affects the throat, producing œdema of the glottis. In cases of this kind the soft parts become swollen, and the glottis nearly or completely closed, and thus life may be destroyed within a very short period after the attack, even in spite of the most prompt and judicious treatment.

The occurrence of effusion on the brain of a *passive* character appears also as a not uncommon cause of death in these cases. When the disease terminates thus, stupor and coma supervene, and the patient sinks gradually, without the occurrence of convulsion, which is rather a symptom characteristic of certain other cerebral conditions to which I shall hereafter have to direct attention.

DIARRHŒA.

As probably bearing some relation to the anasarca observed during the progress of this disease, may be mentioned the diarrhœa which occurs in some advanced cases. This may, I think, be regarded in the light of a watery discharge on the mucous surface, taking place as the result of a general tendency to effusion. This would appear the most probable and natural interpretation of the diarrhœa; for since the blood is watery we may naturally expect the surfaces to yield forth their secretions affected by watery degeneration, and there appears no reason to exclude the mucous surfaces from participation in the action. The diarrhœa is sometimes extremely severe, and has even been the immediate cause of death in some cases.

In regard to its presence as a symptom of kidney disease, Dr. Christison states in his work, published in 1839, that though it had been a common symptom in the cases occurring at Edinburgh, it had failed to attract the especial attention of Dr. Bright in London, and of Professors Andral and Louis in Paris. As affecting this point, I may state it as my belief that diarrhœa has become a more frequent symptom of the Morbus Brightii in London than it was ten years ago; nor do I think it possible that a knowledge of the fact, as given by Dr. Christison, and consequently a more marked attention to the point, has influenced me in this opinion, inasmuch as the cases I have seen during the last few years have several times suffered so severely from diarrhœa as to threaten life,—a condition which it would have been impossible to have overlooked at any time. As regards hospital practice, there has been no alteration in the diet of Guy's to cause this change in the character of the disease, and the greater prevalence of diarrhœa as a symptom attracted my attention long before the last epidemic cholera appeared in, or even threatened, Great Britain. How far that which I have just stated may justify a belief that our climate is undergoing a change, I am not prepared to say ; but would simply direct attention to the subject as one requiring elucidation.

AFFECTIONS OF THE BRAIN.

One of the most important complications occurring during the progress of this disease is an affection of the brain. It cannot be regarded as quite identical with ordinary apoplexy, but is characterised by coma and convulsions of peculiar character. Dr. Osborne regards the head affection of this disease as chiefly caused by arachnitis in a subacute form ; but though it may occasionally be so, still in a great number of cases of this kind, no evidence of arachnitis can be observed, the patient dying of what rather would appear passive effusion into the ventricles, or else of a peculiar state of brain unattended by effusion, and showing no appreciable lesion on post-mortem examination.

This latter condition of the brain is by no means uncommonly observed in the Morbus Brightii after the patient has sunk from an apoplectic seizure, accompanied by severe convulsions approaching the epileptic character.

In those cases in which life is terminated by fatal apoplexy, it will sometimes happen that drowsiness is first experienced, and that this gradually goes on to stupor, vision becoming indistinct, and death taking place either with or without convulsive seizures. It is a peculiarity of the apoplexy occurring in this disease, that it is often accompanied by these epileptic paroxysms, an effect which some have been inclined to attribute to the presence of urea in the blood.

Dr. Addison published a very valuable paper in the Guy's Hospital Reports for April 1839, in which he described the peculiarity of the brain symptoms observed in the Morbus Brightii very characteristically. He notices the general character of cerebral affections connected with renal disease, as marked by a pale face, quiet pulse, a contracted or undilated and obedient pupil, and the absence of paralysis. He next arranges the individual forms of cerebral disorder under the five following heads:—

1. A more or less sudden attack of *quiet stupor*, which may be temporary and repeated, or permanent, and end in death.

2. A sudden attack of a *peculiar modification of coma and stertor*, which may be temporary, or end in death.

3. A sudden attack of *convulsions*, which may be temporary, or terminate in death.

4. *A combination of the two latter:* consisting of a sudden attack of coma and stertor, accompanied by constant or intermitting convulsions.

5. A state of *dulness of intellect, sluggishness of manner*, and *drowsiness*, often preceded by *giddiness, dimness of sight*, and *pain in the head*, proceeding either to *coma* alone, or to *coma accompanied by convulsions;* the coma presenting the peculiar characters already alluded to.

This fifth variety is that which most commonly occurs, and makes its approach in the most insidious manner. I do not think that anything need be added to the above description, which I have taken from Dr. Addison's paper, as it embodies all the important points of the question.

I have stated that the convulsions have by some been attributed to the presence of urea in the blood; and this poisoning of the circulating fluid has also been considered as the cause of death in such cases as die with apoplectic symptoms, without showing any appreciable lesion of brain after death. The brain, in fact, has been considered as poisoned by urinous matters present in the blood.

In considering this question, we must remember some important observations made by Dr. Christison, by which he showed that fatal cases of apoplexy (occurring in the Morbus Brightii) bear no relation to the quantity of urine excreted by the patient. Thus, a large or normal excretion may be going on, and yet fatal coma supervene: on the other hand, in cases characterised by partial suppression, the patient will often go on to the last without head symptoms coming on. This has happened, too, when urea has been shown by analysis to exist in the blood. In these latter cases, not only has the bulk of urine diminished, but the positive weight of solids excreted during the twenty-four hours has been much less than in health; and yet coma has not appeared as a symptom. For my own part, I am greatly inclined to believe that we must look to other causes than the poisoning of the brain by urea for the comatose symptoms and convulsions observed in this disease. It happened to me, not long ago, to examine the blood of a patient who had his senses about him to the last moment of his life, and whose blood was more impregnated with urea than that of any case of Bright's disease that ever came under my notice. He eventually sunk, and it was found that no kidney existed on one side, and that the large complementary organ had its ureter obstructed by a calculus. Now here was complete suppression, the blood loaded with urea, and no comatose symptoms. I think it right to mention these difficulties in arriving at an opinion, though I cannot assist the inquirer to the truth: before leaving the subject, however, I would suggest that it may, perhaps, be found hereafter, that a certain tenuity of blood must exist in connection with the presence of urea in that fluid, before the conditions above noticed can be brought about.

HEART AFFECTIONS.

Among the complications observed in this disease, one of the most common is that of heart affection. The pericardium and endocardium may be simultaneously affected; but by far the most common condition is that of disease of the endocardium, causing deposits or growths to arise on the valvular structure of the heart and great vessels.

The muscular tissue of the heart itself often becomes hypertrophied during the progress of this disease, owing, doubtless, in some cases to obstruction by deposit, affecting the mechanism of the organ. In such cases the usual physical signs of hypertrophy become evident on auscultation ; there is increased dulness on percussion over the region of the heart, while the pulse and beat of the organ are exaggerated. A description of the various phenomena observed on auscultation, and which are dependent on changes of valvular structure, as caused by endocarditis, comes more properly within the province of systematic writers on the subject ; and I therefore shall not enter upon them here, but content myself with urging upon the reader the necessity of examining the heart carefully in all cases of this disease.

The frequency with which heart disease occurs in connection with degeneration of the kidneys and anasarca has led some observers to suppose that the dropsy and other symptoms ascribed to disease of the kidney, are frequently, if not always, caused by the condition of the heart. The experience, however, which we have obtained on this point, certainly goes far to show that where the two lesions exist together, the structure of the kidney is first affected. It is true that cases have been recorded in which the disease of the heart appears to have existed before that of the kidney, and that too from evidence derived from post-mortem examination, shewing the relative state of advancement of the disease in the two organs, and also from the history and symptoms of the cases.

Our general experience on the subject, however, shews the fact that the whole phenomena of the Morbus Brightii, with its complications, constantly occur without any lesion of the heart whatever, the kidney alone being affected.

PULSE.

In connection with this part of the subject I may mention a peculiarity often observed in the pulse of those affected by this disease, and which in all probability is owing to a state of the radial artery corresponding to that which in the large vessels near the heart goes on to roughening of the lining membrane by atheromatous or earthy matter.

This kind of pulse is best described as hard and wiry in character, giving at once an impression that the vessel beneath the finger is less elastic than in health. The blood, too, as it passes along, appears to take a tortuous course.

This symptom exists sufficiently often in albuminuria and disease of the heart to deserve especial notice from the practitioner. If, indeed, we observe it in connection with pallor of countenance,* we shall seldom be far wrong in predicting that the urine will be found albuminous, and the patient the subject of confirmed kidney disease.

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* A pallid countenance is noticed in the writings of Aetius as indicative of a hardness of the kidneys. I am indebted to my colleague Dr. Addison for this curious reference.

AFFECTIONS OF THE LIVER.

It has been shown, not only by the symptoms arising during the progress of the disease, but also from the evidence of post-mortem examination, that the liver frequently becomes involved when the kidneys are affected with deposit. Some authors are inclined to consider that there is some similarity in the nature of the deposit occurring in the two organs, and that therefore they owe their diseased condition to one and the same constitutional cause: a notion is also prevalent that the kidney secondarily affects the liver. I am not disposed to believe that there is any connection between the state of these organs when simultaneously diseased, further than that intemperance and bad living are common causes for disorders both of the kidney and liver; and am disinclined to admit that any reflected mischief is inflicted by the kidney on the latter organ.

Rayer found that only about one-third of the fatal cases examined after death shewed affection of the liver, and in half these cases the deviation from the natural state was so slight as scarcely to deserve notice. Dr. Bright found the liver sound in 40 per cent. of his cases; and in 18 only of the remaining 60 was the lesion of severe character.

The form of diseased liver usually present in connection with albuminuria and diseased kidney is that of cirrhosis and the tubercular nodulated liver known as the hobnail, contracted, or "drunkard's liver." We shall generally find this organ diseased in those severer cases of ascites which sometimes accompany the anasarca of kidney disease. It must be remembered, however, that such state of liver is by no means necessary to the production of ascites, which is often present when the liver is perfectly sound.

BRONCHITIS.

Bronchitis, in the acute or chronic form, is a very common complication of this disease. How far, however, it is to be considered as a result of the conditions which tend to produce the granular degeneration of the kidney, appears somewhat doubtful. We must remember that patients who are brought to the hospitals with anasarca have very frequently been exposed to cold, and thus to the action of a sufficient cause for the bronchitis. On the other hand, bronchial disease is, doubtless, much aggravated by the general tendency to effusion which, in advanced stages of albuminuria, greatly obstructs the lung by producing an œdematous condition of its structure.

PLEURITIS, PERITONITIS.

In the history of kidney disease as connected with albuminous urine, a tendency to inflammatory affections of the serous membranes was early noticed. Pleuritis more especially was known to occur, and the peritoneum was also occasionally observed involved by inflammatory attacks. According to the experience of M. Solon, these complications are extremely rare in France. In England, however, they occur sufficiently often to render it necessary to warn the practitioner to examine particularly, should any symptoms arise pointing to the probable existence of either of the above serous inflammations.

PNEUMONIA.

Pneumonia, sometimes of severe character, is apt to arise during the progress of kidney disease. This affection may occur alone, or be complicated with pleuritis: the latter is perhaps the more frequent condition. The short cough and pungent heat of skin will in such cases generally guide us to a true knowledge of the patient's condition, even when pleuritis is present to complicate the auscultatory signs. It sometimes happens, however, that this inflammatory condition will creep on insidiously; and it is necessary that the medical attendant should constantly be on the watch, making careful exploration of the chest wherever the slightest dyspnœa (short cough) or distressed expression of countenance is to be observed. Sometimes the movements of the alæ nasi alone may lead us to inquiry and to the detection of this complication.

PHTHISIS.

Tubercular disease of the lungs has been observed in connection with kidney disease and albuminous urine, by all who have had any experience in the disease. Dr. Bright mentioned the fact in his earliest communications on the subject, and it also attracted the attention of Drs. Christison and Gregory.

Dr. Bright expresses himself not only as disinclined to believe that there is any association or connection between the two conditions, but is of opinion that this form of renal disease is, if anything, unfavourable to the development of pulmonary phthisis. Rayer, on the contrary, holds the opposite opinion, differing from Bright, and also from Martin Solon, whose opinion accords with that of Bright.

The great prevalence of phthisis in England renders it extremely improbable that any general connection which might exist between that disease and the Morbus Brightii would have been overlooked by us here. My own opinion is quite in accordance with that of Bright and Martin Solon, as derived from a consideration of the frequency with which the two conditions are observed to occur together; but I believe more matured experience will probably show that there is some connection between phthisis and that which is the *rarer* form of diseased kidney described under the generic name "Morbus Brightii," viz. that form which appears more properly to belong to the class of tubercular and scrofulous diseases, and which has been described as the fatty kidney, and treated of at the commencement of this work.

PSEUDO-RHEUMATIC DISEASE.

Several writers have described rheumatism, chiefly in the chronic form, as a frequent concomitant of kidney disease. I have often observed the condition referred to, and there is great truth in the observation of Dr. Christison, that such cases partake generally of a neuralgic character. For my own part, I consider them quite peculiar, and in all probability produced by the condition of the blood induced during the progress of the kidney disease. Such cases are not amenable to the treatment which serves us in rheumatism, and the general character of the swelling differs materially. The fasciæ appear involved rather than the joints, and the pain is frequently far greater than the swelling would seem to account for. It most nearly approaches in character to those rheumatic affections about the joints by which the ligaments are involved; but then the inflammation is never of so acute a character as in that disease. On the whole, it can scarcely be called a rheumatic affection, though it is sometimes as difficult of cure as any of that class with which we are acquainted.

CAUSES.

In treating of a disease, perhaps few parts of the inquiry are less inviting than that which refers to the detection of its cause; a source of discontent which must inevitably force itself upon the minds of all who have studied disease in a philosophical spirit, from the knowledge that the effects we observe are so very frequently produced by the concurrent influence of many conditions, rather than by the unaided power of a single noxious cause. It is not alone to the relation between exciting and predisposing causes that the above remark applies. Several exciting causes, instead of one, may be of necessity required before disease can be set up; while any one of these alone, or even the whole number short of any one, may be inadequate to produce the effect we observe, even though assisted by all the necessary predisposing conditions.

The causes for the diseases of the kidney, of which we have been treating, are not very satisfactorily ascertained. Among the principal predisposing causes, we may probably correctly enumerate the scrofulous habit and intemperance, while exposure to a cold or damp atmosphere, or the presence of any condition tending to interfere with the proper discharge of the function of the skin, may be regarded as the chief exciting cause for the disease.

Kidney affection following scarlatina.—With respect to the invasion of previous disease as a cause for affections of the kidney, it has long been known that the dropsy which appears after scarlatina is very generally attended with an albuminous condition of the urine ; and it is certain that notwithstanding the affection is generally easily recovered from under proper treatment, such cases occasionally go on to confirmed and destructive disease of the kidney. It appears probable, indeed, that if any predisposition to kidney affection exist on the part of the patient, an attack of scarlatina may be looked upon as the forerunner of one of the most unmanageable diseases which can infest the human frame.

It by no means happens, as might be supposed at first view, that anasarca is more apt to follow the severer forms of scarlatina; on the contrary, it is for the most part observed as a sequel to milder cases of the disease.

From what I have heard, I cannot but think that there is too general an impression that this kidney affection, attended with dropsy and following scarlatina, is a complaint from which the patient has little to fear. Experience has shown me, however, that even when we have some reason to believe such to have been the case, when all symptoms have indeed been relieved for months, the kidney affection has, notwithstanding, been insidiously progressing, and has shewn itself eventually in a severe or fatal form.

Though it is true that death rarely occurs in these cases as a more immediate result, still this is far from a universal rule, as will be attested by all who have given their attention to the subject.

The supervention of head symptoms has been the cause of death in such early fatal cases as I have had the opportunity of observing, post-mortem examination indicating but little organic change in the kidneys. The general condition has been that of congestion. In one case, however, I observed a generally anæmiated state of the cortical portion, while the tubular portion of the kidney was congested. The appearance of the surface of the organ, as exhibited by section, was in this case peculiar, some parts looking denser and others coarser than in health,—a condition probably brought about by adhesive inflammation and deposit. The true nature of the disease is probably in its commencement such as Dr. Johnson has described as leading to desquamation of the epithelium lining the tubular structure of the kidney, and bearing, perhaps, some relation to the desquamative action observed on the part of the skin. The state of the organ which produces this effect is probably such as will induce severe inflammatory action, if there be any predisposition to acute disease on the part of the organ.

Urea is early found circulating in the blood during the progress of these cases. I detected it in considerable quantity in one which terminated fatally within seven weeks from the attack of scarlatina, and five weeks only after the consequent anasarca was observed.

As regards the question in how far the state of the skin is to be looked upon as the cause of mischief to the kidney, when the organ becomes diseased after an attack of scarlatina, it is necessary to state that considerable difference of opinion has arisen. Dr. James Millar, whose experience appears to have been very great upon this point, states that out of 219 cases of scarlatina observed by him, 59 were followed by renal anasarca, and that in 10 of the 59 the anasarca occurred without any of the outward signs of the disease. Dr. M. believes that there is a peculiar affection of the kidneys occurring in scarlatina,—an affection which sometimes attacks the kidneys alone, producing albuminuria without the skin having its condition changed by desquamation.

There appears some show of truth in the above view (such cases not very uncommonly occurring in neighbourhoods where scarlatina prevails); but allowing this, it scarcely need be accorded that the skin is in a natural condition, even though the eruption of scarlatina and the desquamation of the skin may not have been observed; and we know from the general history of albuminuria how important a part the skin takes in the causation of the disease.

It has been doubted whether this form of disease of the kidney supervening on scarlatina be identical in character with kidney affections accompanied with albuminous urine arising from other causes. One great reason for this doubt consists in the fact, that the former disease generally admits of cure, while the latter as generally baffles treatment. For my own part, I am inclined to regard these diseases as identical, and to consider the kidney affection following scarlatina as an inflammatory condition which would go on to induration, and probably to contraction of the organ, if neglected, and pursue, in fact, the exact course of that form of the Morbus Brightii which I have described as the most commonly observed. The greater curability of the disease in the one case arises, I believe, from our attention being immediately directed to the state of the kidney after scarlatina by the very general occurrence of that obvious symptom, anasarca. We do not so generally have this symptom to assist us in the other class of cases, or it is only presented as a guide when the disease has advanced considerably. The importance, then, of acquiring such a knowledge of the Morbus Brightii as shall enable us to diagnose it early, and quite independently of the symptom of anasarca, can scarcely be too urgently insisted upon.

TREATMENT.

The treatment best calculated to relieve this disease must of course vary according to the degree of severity marking the symptoms. In the acute form we are occasionally obliged to have recourse to very active measures, which, though we are driven to them by necessity, must yet be used with the greatest care, for the reason that the secondary conditions known to occur during the progress of the disease are such as will be greatly aggravated by the constitutional effects of active and depletory treatment. It is, therefore, of the greatest importance that we should pay strict attention while forming an opinion as to the amount of depletion or depression to which the patient can be safely submitted. Thus, if the acute symptoms be not engrafted on old disease, but are the indications of a first attack, we may be more bold in our measures, and feel less fear of producing serious mischief by inducing that watery condition of the blood which in old cases speedily assists the disease to a fatal termination. Another point which it is necessary to consider as affecting treatment, is the constitution of the patient, both hereditary and acquired. Those who have been addicted to intemperance, and more especially to the use of ardent spirits, are well known to be bad subjects for depletion, whatever may be the form of disease with which they are attacked; and this rule applies, in all its force, to those afflicted with the Morbus Brightii. Again, the existence of struma in the family, or its presence in the person of our patient, are circumstances into which it is right to inquire and examine carefully.

The difficulty of discriminating, more especially whether or not the acute symptoms be engrafted on old disease, has been already noticed; and in our treatment, when in doubt, we may be regarded as acting on the safe side by rather avoiding than urging active measures. This rule is not only in accordance with what we know of the pathology of the disease in its relation to treatment, but also with the fact that the great majority of cases coming under our notice are of an insidious character, and have progressed considerably before any marked acute symptoms have attracted the attention even of the patient himself. When treating any of the inflammatory complications I have described as occasionally occurring during this disease, it will be well carefully to bear in mind the foregoing rule. The depletion which might be necessary to check the progress of pleuritis or pneumonia in one not suffering the attack as a complication of kidney affection, if exhibited during the progress of this disease would place the patient in a most unfavourable position for recovery, and especially tend to accelerate death if the acute symptoms happened to be engrafted on an old case of albuminuria. We must never forget, then, that our patient has to go through a long and arduous struggle with the original disease, while we are adopting measures to deliver him from the imminent danger of an acute attack.

When our treatment has succeeded in relieving all symptoms, and the urine has been free from albumen for many weeks,—a state of things which we may hope to bring about in early cases,—it is highly important to enforce upon the mind of our patient the absolute necessity of continued care, and close attention to symptoms. The more immediate cause of distress may have abated, but we must not forget that we have a tendency to diseased action on the part of the kidney which it will require the greatest watchfulness to counteract.

It may be well thus early to state, as a general rule of treatment, and one against which we are scarcely ever justified in acting, that when our patient is anæmiated we should forego depletion by blood-letting in every form, even though inflammatory complications of the acutest character may be present. All indications may, in most cases, be answered by hydragogue cathartics and the judicious use of antimony.

As regards the treatment of this disease when it occurs in the acute form, and apparently affects the kidney for the first time, then, even where no complications are present, we may derive benefit from such mild antiphlogistic measures and careful depletion as may tend to relieve the congested state of the kidney. In young persons especially, saline purgatives, the vapour bath, and antimonials, are indicated; while we shall do well (whatever be the condition of the urinary excretion either as to quantity or quality) to avoid diuretics of every description. The probable state of the kidney must never be lost sight of, and everything tending to determine to that organ, either in the form of medicines or articles of diet, should be studiously avoided in this early stage.

It has been a very common practice to take blood by cupping the loins in acute cases, and when carefully done in small quantity I have reason to believe with benefit to the patient. This depletion, however, must not be carried far, and for the reason that we know the tendency of this disease is to go on to a second stage, in which the blood becomes watery and degenerate; and nothing tends more to induce this watery state than blood-letting in any form. This need not deter us from small cuppings over the loins, however, in cases characterised by hot skin, quick pulse, and thirst; indeed, in such cases we can do good by small depletions, while at the same time we keep up the action of the skin by antimonials and febrifuge medicines. Antimony has obtained so high a character as a remedy in this disease that some have even gone so far as to believe that it possesses a specific action as a cure. There is no occasion to have recourse to such a view, however, since the therapeutical action of antimony is precisely such as we require to meet the pathological conditions presented to us in albuminuria.

The diaphoretic action, which perhaps far exceeds that of any remedy with which we are acquainted, and which is brought about without excitement to any organ, while the heart's action becomes moderated, are properties sufficiently desirable to recommend antimony as a valuable means of suppressing the tendency to congestion on the part of the kidney.

When inflammatory complications are present in any stage, we shall do well, if possible, to urge antimony as a remedy in preference to venesection. This cannot always be done, owing to the nausea induced, but still where it is possible the withdrawal of blood had better be avoided, and other means than the exhibition of antimony be had recourse to for the production of diaphoresis.

In many cases, however, it becomes absolutely necessary to have recourse to the lancet, especially when the chest becomes involved, in early and acute cases of the disease. Even under such circuustances, it is right, however, most carefully to watch the effect of bleeding, and never to lose sight of the fact that we are treating the complication of a disease, and that while we are conquering the inflammatory mischief, we must as much as possible husband the strength of our patient in order to enable him to struggle through the original dangerous malady.

Among the methods which have been resorted to in order to obtain such an action of the skin as may tend to relieve inflammatory conditions, the hot air bath deservedly holds a prominent place. It may be applied with the greatest facility and convenience, and it is now constructed at the price of but a few shillings, on a plan which allows of its application while the patient lies in bed. A tube, which serves as the chimney to a spirit lamp, is merely introduced under the bed clothes, which are firmly tucked in under the patient, who is soon covered by a profuse perspiration, supplying moisture from his body to the hot and dry atmosphere which surrounds it.*

When it is desired to place the patient under the effects of antimony, the best plan we can adopt is to have recourse to the Vinum Antimonii potassio-tartratis, in doses varying from twenty minims to half a drachm, combined with the liquor ammoniæ acetatis, in doses of from two drachms to half an ounce. This may be administered in any mild or demulcent vehicle every four or six hours, according to the nature of the case.

If the pulse continue sharp and the skin fail to act in acute cases under the use of this remedy, and if there be much complaint of pain in the lumbar region, and the urine be excreted in small quantity, it will be well, as before stated, to take a few ounces of blood by cupping over the lumbar region: in most cases, however, even this amount of depletion will not be required, and is not advisable unless we can satisfy ourselves of the early character of the disease. The bowels must be watched and kept in moderate action while this plan of treatment is carried out. An excellent form of purgative for this purpose is the following combination of jalap and bitartrate of potash:—

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* A cheap form of this apparatus may be obtained at Mr. Bigg's, instrument maker, St. Thomas's Street, Southwark.

℞ Jalapæ contritæ, ℈j.
Potassæ bitartratis, ℈ij.
Capsici contriti, gr. ss.

This, which constitutes the compound jalap powder of the Guy's Pharmacopœia, may be given at intervals in doses of from half a drachm to a drachm, according to the habits and age of the patient.

In early cases which do not show any of the complications described as occasionally occurring during the progress of the disease, we may often succeed in completely relieving our patient on the above plan, which, notwithstanding its simplicity, far exceeds in efficacy any other with which I am acquainted.

Among the remedies that early suggested themselves to the minds of practitioners, mercury in its various forms naturally took a prominent position, in the hope that it might prove valuable by affording relief in this as in other inflammatory conditions. Having watched several cases which were subjected to such treatment, I feel I can assert with some confidence that we have but little to hope from the remedy in this disease. Mercury does not here appear to exercise its usual action; indeed, the great facility with which profuse salivation is produced in the Morbus Brightii, even by small doses of the drug, renders it most unmanageable, as has too frequently been shown, even in the hands of those who are well acquainted not only with the use of mercury, but also with those phases of the disease most likely to be benefited by its administration.

Those who have not had experience on this point will be unwilling to believe how small a quantity of mercurial medicine, even of the mildest kind, is capable of inducing salivation in this disease to a degree calculated greatly to debilitate the patient. Even a single purgative containing calomel has been known to induce dangerous salivation, and in the latter stages of albuminuria great mischief has often been done by ignorance on this point.

With respect to the treatment of the various inflammatory complications by mercurials, and more especially by calomel, we shall do well to avoid them entirely. If inflammation run high, antimony in increasing dose will almost always be found sufficient to repress action, and answer the desired end. Cupping or leeching used discreetly, and in full remembrance of the secondary conditions which this disease is capable of producing, are, I believe, under any circumstances more admissible adjuvants to antimony than mercury in any form, especially as exhibited with the intent of obtaining its antiphlogistic effects. Among the various remedies influencing the circulation, and which have been exhibited in the Morbus Brightii, digitalis has enjoyed a considerable amount of credit, and when discreetly exhibited there seems much apparent benefit from its use. The diuretic action of this drug is not of a stimulant kind, and when anasarca or ascites is present in any great degree, this quality is occasionally of much service. The dose should be small, however, and its effects on the pulse narrowly watched. This watchfulness is especially necessary when we are treating acute symptoms supervening on old disease, when we so often have a morbid condition of the heart present. When digitalis is indicated, the addition of from five to ten minims of the tincture to each dose of the mixture of acetate of ammonia and antimonial wine, described above, will form an excellent mode of exhibiting it.

When inflammatory symptoms run high, we may occasionally use opium with great advantage, combined with antimony or with ipecacuan as it exists in the compound ipecacuan powder: it may be exhibited at night, and will often, by obtaining sleep, assist in allaying irritability and quieting the action of the heart. The dose of opium should at first be small—from half a grain to a grain for an adult,—and its effects must always be closely watched. This is necessary, owing to the liability to head symptoms which characterises this disease, an evil occasionally arising in a most unexpected manner. Whenever we are exhibiting opium it will be right to watch the pupils from day to day, and if we observe anything approaching to inordinate contraction, to omit the remedy immediately. This drug, from its known action on the skin and its great power over the heart, would appear especially indicated in the acute form of this disease: it must, however, be most carefully watched in its effects, for the above-mentioned reasons, and whenever we find antimony answering the desired ends it is as well to avoid the use of opium altogether.

When the chronic form of the disease is to be treated, we have to consider conditions greatly varying from those of the acute stage. The blood is now deficient in red corpuscles, and there is nothing to indicate a tendency to inflammatory disease. In such uncomplicated chronic cases the object now is to remedy the evil which has been inflicted on the blood by the continued drain of albumen; to restore the red corpuscles, and by thus affecting the circulatory fluid to place the patient in a better position for recovery. The little hope we have a right to entertain of effecting the cure of such cases has already been noticed, but though this may be the case, we still have it in our power greatly to relieve our patients—to lengthen life, and place them in such a position as may give them a right to hope to live a few years, and be able, moreover, by great care, to follow any not very arduous vocation without much distress. This advantage is chiefly obtained from the use of iron, exhibited with a view of supplying red corpuscles to the blood, an effect which we now know beyond a doubt is produced by its use in cases of anæmia generally. While we are answering this indication we must assist as much as possible in relieving the blood of the excess of water contained in it. This is to be done by the use of hydragogue cathartics, exhibited at intervals, according to the state of the patient. It may so happen that a diarrhœa may set in, requiring all our care to control it; but this is an exception to the rule, and we shall fail in obtaining the proper action of iron, if we do not assist its action, by the use of hydragogues. For this purpose I know no remedy to equal elaterium.

I have seen many cases in which life seemed ebbing fast, owing to the immense effusion into the great cavities, and in which those unaccustomed to observe the disease considered that rapid dissolution must take place, recover so far in twelve hours, by the use of this remedy, as to be in a state of comparative safety; the relief from dyspnœa, and the rising of the pulse immediately on the action of the elaterium commencing, is very remarkable.

The best form of iron I know of to effect the cure of the anæmia of the Morbus Brightii is the Mistura Ferri Composita of the London Pharmacopœia. The stomach will not always bear this, however, and then we must have recourse to the Vinum Ferri, in doses of from one to three drachms, or to the various more palatable preparations of the metal. Among these I may mention the ammonio-citrate and ammonio-tartrate of iron, the latter perhaps the better of the two. These ferruginous preparations may, in chronic cases, be administered with the infusion of Calumba, and taken two or three times during the day. It is in treating chronic cases of the Morbus Brightii that we gain the greatest benefit from the hot air bath already described. Its use two or three times a week is often of great service. It relieves the blood of its redundant water, and greatly assists the case. We must be careful, however, to watch the powers of the patient during its application.

The great indications to be answered, then, in chronic cases are—1st. The relieving the blood of its superfluous water; and 2dly, supplying it with iron to assist in the production of the red corpuscles of the blood.

Astringent remedies have occasionally been had recourse to in these chronic cases, administered with the view of stopping the discharge of albumen, and so protecting the blood from further degeneration. This view must be looked upon as valuable, and from the histories of some cases, and indeed in one or two which I have watched myself, some benefit appears to have arisen from this plan of treatment: the albumen appears to be discharged in smaller quantity. Further experience is wanting, however, on this point. Among the astringents which have been used, may be more especially mentioned Tannin, Catechu, and Gallic acid.

I have great reason strongly to urge the use of counter-irritation, in the form of seton or issue, in the chronic stages of Bright's disease. They occasionally expedite the cure, though it is necessary that the discharge produced should not become excessive; for we may, by neglecting this precaution, add another to the great cause for degeneration of the blood which already exists in the presence of the disease itself.

An issue in the loins worn for months, and even years, I have known apparently keep the disease at bay, and protect the patient from the occasional supervention of those active symptoms which so commonly cause the sudden destruction of the victims of this disease.

When anasarca becomes so considerable as to cause painful distension of the cellular tissue, we may give great relief to the patient by puncturing the skin about the parts chiefly affected. There are several modes of doing this: the punctures may not only be made of various sizes, but to varying depths beyond the skin into the cellular tissue. It is necessary, if we wish much to relieve our patient, that the lancet's point should enter to some depth; but this must not be done directly towards the central parts. The lancet should be introduced obliquely at each puncture. I have never seen any mischief arise when the operation is so performed, and know no objection to the puncture being as large as is made by introducing a common lancet up to the shoulder. These punctures need not exceed from four to six in number, and in parts judiciously selected for the relief of tension—in dependent positions, and where they are not likely to suffer attrition. There is an excellent method of obtaining relief from anasarcous distension which I first saw practised by my colleague, Dr. Babington. It consists in introducing the lancet several times by the same opening made through the skin, and each time varying the direction of the point. In this way we succeed in opening a large number of cells, while we wound the skin in one place only. A large quantity of fluid may be discharged in this way in a very short time.

I have stated that during the progress of this disease the most sudden and dangerous symptoms may arise. These symptoms immediately threaten life, and require all the decision and address of the medical attendant. The occurrence of apoplexy and œdema of the glottis are, perhaps, among the most formidable of these, and as such, call for especial notice.

The apoplexy, which is generally of serous character, is best relieved by purging, by derivative enemata, and counter-irritation at the back of the neck. If the patient can possibly be made to swallow, the bowels should be called into action by elaterium, which may be exhibited in the dose of from a quarter to half a grain, repeated every fourth hour until an effect is produced. The Enema Terebinthinæ of the London Pharmacopœia should be thrown up the rectum as soon as possible, and the patient's head well supported.

If the attack of apoplexy have supervened on an acute case, we shall sometimes do well, especially in young subjects, to take a few ounces of blood by cupping at the nape of the neck. It is always right to avoid this, however, if the disease has made much progress prior to the occurrence of the apoplectic symptoms. We should never relax our efforts in these cases, which will sometimes rally from conditions which would scarcely leave us a hope, were the apoplexy not connected with kidney disease.

When effusion takes place suddenly about the glottis the most energetic measures are necessary to preserve life. The great object in such cases is, to determine to the surface as rapidly as possible by derivatives: for this purpose the blistering fluid is the best, and it should be freely applied over the region of the larynx and up to the chin. I once saw life apparently saved by the use of boiling water as a vesicant, and as it is a means of relief nearly always at hand, it is well to know its use. For my own part, I should never scruple to use it in this class of cases when suffocation was threatening. The mode of applying it is to dip the corner of a fine towel into a kettle or other vessel in which water is boiling fast, and having retained it there sufficiently long to acquire the full temperature of the water, to remove it and apply it as rapidly as possible over the region of the throat. The neck and parts around, which it is not wished to vesicate, should be carefully covered by thick cloths before the boiling water is applied.

APPENDIX.

EXTRACTS FROM THE GULSTONIAN LECTURES FOR 1845, DELIVERED AT THE ROYAL COLLEGE OF PHYSICIANS, BY DR. OWEN REES.

THOUGH many years have elapsed since Dutrochet pointed out the curious property possessed by membranes of allowing the mixture of fluids to occur through them, not only by permeation or imbibition, but by a powerful force, when any difference in the specific gravity of such fluids exists, still, it is only very lately that this power has been considered in its relation to pathology, and I will therefore shortly state the conditions of endosmodic action. If a tube be closed at one end by membrane firmly secured over it, and then used as a vessel to contain a saline solution, we shall find, on allowing the end secured by membrane to stand in a dish containing either water or a saline solution of less specific gravity than that contained in the tube, that a very rapid action will take place through the membrane, causing the tube to become filled from without, and in opposition to gravity. If we now examine the fluid in the dish, we shall find that a certain quantity of the contents of the tube has descended into it; but the tube will be found to have received a far larger proportion of the fluid in the dish, and if we allow the action to continue, it will at last be filled to overflowing. If we modify this experiment, by putting in the dish a fluid of a higher specific gravity than that contained in the tube, we shall find that the tube, instead of filling, becomes rapidly empty, shewing that in both these cases the fluid of high specific gravity attracts that of lower density in larger proportion through the membrane dividing them. It must be remembered that the heavy liquid always passes in a certain proportion through the membrane, but always in small quantity compared with that of the lighter fluid. Having premised these observations on endosmodic action, I shall now proceed to consider the blood in its physical relations, and in doing so shall regard it as it is generally believed to exist in the circulation, viz. as liquor sanguinis, containing floating coloured bodies designated blood corpuscles or globules. My reasons for following this method are, firstly, to ensure a more thorough understanding of several points to which I shall have occasion to refer; secondly, that I may have an opportunity of shewing you that this is really the true condition of the fluid blood as it exists in the vessels; and thirdly, because it is in this form that I believe blood ought to be considered pathologically.

I shall first direct attention to the floating corpuscle. This body has been very differently described by physiologists; some have considered it as composed of solid matter—in fact, that it is a soft solid—while others consider it to possess a vesicular structure. There are considerable and important differences of opinion, however, existing even among those who agree in believing the corpuscle to be a vesicle, some regarding it as made up of a white membrane, containing a fluid of a red colour, while others believe that the vesicle is red, and the contained liquor of a pale tint. The existence of a nucleus in the corpuscle of the human blood is also denied by many; and the exact situation it occupies again divides the opinions of those who believe in its presence. In considering these conflicting opinions, it might at first appear a matter of extreme difficulty to resolve any part of a question depending so much on microscopical evidence; but though there are still many difficulties to contend with in the demonstration of a nucleus, we have fortunately obtained a means of determining pretty certainly two of the points in question: firstly, that the corpuscles possess a vesicular structure; and secondly, that the fluid contained within the corpuscle is red, and the containing membrane white.

If fresh blood be mixed with a watery solution of sugar, salt, or indeed any soluble matter which will not act chemically on the blood, we shall find, on microscopical examination, that certain physical effects are produced on the corpuscles, varying according to the specific gravity of the solution with which the blood has been mixed. Now, presuming the blood corpuscle to be a vesicle or closed membrane containing a liquid, the specific gravity of this must be the same as that of the fluid in which the corpuscle floats, for such is the necessary consequence of stasis; and if, by altering the specific gravity of the fluid suspending the corpuscle, we can alter the condition of the vesicle itself, by changing the proportion of its contents, in accordance with the laws governing endosmodic action, it is no longer possible to resist the conclusion that the blood corpuscle is truly a vesicle or bladder containing fluid. Experiment has shown that such effects really occur: thus if we mix freshly-drawn blood with a solution of a specific gravity higher than that of the liquor sanguinis, we immediately observe the form of the corpuscles to alter; they become flaccid and empty, owing to the liquid of high specific gravity having drawn from the vesicle a larger proportion of fluid than it supplied to it, in accordance with the law of endosmosis. If we reverse this experiment, by mixing with the blood a solution of lower specific gravity than that of the liquor sanguinis, a contrary effect is immediately produced, the corpuscles becoming distended and rounded in a very marked degree; more fluid in this case entering the corpuscle, while but little will pass out. If to these corpuscles, so altered by the action of solutions, we now again apply these tests, but on this occasion add the solution of low specific gravity to the collapsed corpuscles, and that of high specific gravity to those distended, we shall find that we are enabled to return each specimen to its former condition, or nearly so. We can always, however, distend the corpuscles which we at first collapsed, and collapse those we at first distended, by treating them in this manner. The effects I have shewn must not be confounded with the action of simple permeation or imbibition; they have no analogy with such effects, but are results identical with those obtained by Dutrochet in his experiments relating to the action of fluids varying in specific gravity when applied to the opposite sides of the same membrane. It has been found by careful experiment that in order to collapse the corpuscles a solution of sp gr. 1060 is required; but this acts slowly in some cases, and to produce the effect decidedly a solution of 1070, or more, should be employed. Solutions cease to distend the corpuscles when of sp. gr. 1050 to 55, and to distend them well a solution of 1015 or 20 is desirable. Now the specific gravity of the blood is about 1057 to 60; and as the corpuscles remain unaltered by solutions of from 1050 to 1060, we may conclude that the average specific gravity of liquor sanguinis lies somewhere between those two points, which it is a matter of some interest to have ascertained, as it proves that the fibrin of the blood is dissolved, and not suspended in the liquor sanguinis: for were the latter the case, the corpuscle would be rapidly collapsed by solutions of 1050, inasmuch as the serum suspending the fibrin could only have a specific gravity of 1029 to 30, and the corpuscle would of necessity contain a fluid of no higher specific gravity than this.*

Having thus, I trust, proved that the blood-corpuscle possesses a vesicular structure, I shall proceed to the examination of its contents, and to describe the method of determining whether the vesicle or membrane be of a red colour, or, on the contrary, that the red colour of the corpuscle depends on the contents of the transparent membrane, the membrane itself being white. I have already shown that liquids of high specific gravity are capable of drawing out a large proportion of the contents of the corpuscles, and so rendering them flaccid, while liquids of a low specific gravity draw out but little of their contents, supplying to them a larger portion of fluid than they draw from within, and thus producing distension. Now this being the case, it is evident that if we obtain some means of ascertaining the colour of the fluid floating round these corpuscles, both in the distended and flaccid state, we shall (presuming the contained liquor to be of a red colour) be able to detect in one case a deep red tinting, and, in the other, a very light stain, only communicated to the fluids in which the corpuscles float. It having been proved microscopically that liquids pass in and out of the blood corpuscles in proportions bearing a relation to their specific gravity, that is to say, in accordance with the established law of endosmosis, it occurred to me that as we should be able by treating a collected mass of corpuscles with solutions differing in density to produce the same effects on a larger scale, we ought to find that the heavier liquid, having drawn out a large proportion of the fluid contents of the corpuscles, would be observed of a deep red colour, while the liquid of lighter specific gravity having drawn out a less proportion of the contents, would be but slightly tinted, having, in virtue of its low specific gravity, entered the corpuscle in larger proportion, and drawn out but little of its coloured liquid. These experiments were made, and they proved in a striking manner that the liquid withdrawn from the corpuscles was of a red colour; the solution of specific gravity higher than that of the liquor sanguinis having produced on the subsidence of the corpuscles a supernatant fluid of a deep red colour, while that of lower specific gravity yielded a supernatant liquor of a pale rose tint. It now could no longer be a matter of doubt that the colour of the liquid enclosed by the vesicle was red, but it still remained to be shown that the vesicle itself was white; and, fortunately, we possessed an easy method of effecting this. It is well known to those who examine the blood microscopically, that when pure water is added to the corpuscles, they are at once destroyed, and the observations above detailed afford an easy explanation of this phenomenon, for a rapid endosmodic action tending to fill the corpuscles must of necessity occur on the addition of water, and the delicate membrane could scarcely be expected to withstand this sudden effect, and would probably burst; at least such was the natural conclusion, on the correctness of which the success of the following experiment was dependent, it being made with a view of examining the colour of the burst cases or envelopes, which had formed part of the now disintegrated corpuscle. The experiment consisted of the following steps:—A quantity of corpuscles were allowed to subside from serum into which they had been introduced, by breaking up into it a portion of crassamentum, and then pouring it off, while containing corpuscles in suspension, leaving behind the coarser particles of broken crassamentum, which were allowed time to sink to the bottom. This mixture was set to stand during several hours, at the expiration of which time the corpuscles had collected at the bottom of the vessel. The supernatant clear serum was next poured off, as nearly as could be effected without disturbing the deposit. This having been done, the mass of corpuscles was thrown into distilled water, and this mixture set aside for twelve hours. The anticipated result was now obtained: the water had burst the corpuscles by rapid endosmose, the burst envelopes had subsided, and were collected in a white stratum as a precipitate, while the supernatant liquid held the red colouring matter in solution.

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* These experiments were first published in the Guy's Hospital Reports, forming part of a paper communicated by Mr. Samuel Lane and myself.

I have as yet noticed the corpuscle only so far as its vesicular structure is concerned; but there is another point, and one of great interest, on which much light can be thrown by the last experiment.

The existence of a nucleus in the human corpuscle is a question dividing the opinions of physiologists and anatomists; nor is it a matter of surprise that such should be the case, inasmuch as the appearances presented under the microscope are such as, at a first view, entirely to discountenance such an idea; while, on the other hand, analogy would lead us to believe in a nucleus. Careful disintegration and examination of the corpuscles, however, yield appearances rendering the existence of this body more than probable. I have stated that on rupturing the corpuscles by water, we are enabled to collect a white precipitate. Now, if the blood-corpuscle be made up of a vesicle enclosing a nucleus, as well as a red coloured fluid, we ought (unless the nucleus be soluble) to be able to detect it by microscopical examination in the white débris of the corpuscles forming the white precipitate. I have carefully examined this deposit, and find it made up of three kinds of bodies:—1st, substances quite such as might be expected to result from the bursting of envelopes, having the appearance of shreds of membrane, some corrugated, others flattened out; 2dly, white bodies, somewhat resembling the blood-corpuscles, thin at their edges, and about two-thirds the diameter of the corpuscles; 3dly, granules, probably due, in part, to serum, and I have reason to believe, in some measure, to partial disintegration of the nuclei. The solid bodies of larger size, I feel persuaded in my own mind, are truly the nuclei of the red corpuscles. I have said that these bodies, as existing in the precipitate, are two-thirds the breadth of the corpuscles themselves; and it may be matter of surprise that so large a substance entering into the composition of this structure should not at once show itself when the blood is exhibited in its perfect state under the microscope; but the fact is, that the refractive power of this body is so nearly identical with that of the fluid contents of the membrane by which it is surrounded, that it is not until this condition is altered by processes such as I have described, that we are enabled to detect the outline of the nucleus satisfactorily. The bodies I have just noticed as nuclei have been frequently mentioned by micrographers as "corpuscles deprived of their colouring matter," and, indeed, they have very much that appearance after maceration in water, being quite two-thirds the size of the blood-corpuscles, and therefore far exceeding the dimensions which most persons would be inclined to allow them. It might be asked, what a corpuscle, deprived of its colouring matter, becomes? From that which I have already shown, we see that such a condition cannot well be brought about without bursting the vesicle, and allowing its contents to escape; in which case any solid capable of assuming a definite form, and observed in the débris, must be regarded as having once formed part of the perfect corpuscle; and it is this which I consider we must call the nucleus. Those who make a study of the microscopic characters of the blood will, I think, best be able to persuade themselves of the truth of the position I have advocated, by experimenting on the blood of birds, and comparing the results obtained with specimens from the human subject similarly treated. Thus, if a specimen of each kind be placed in a drop of water, on a slip of glass held in an inclined position, and then examined under a powerful microscope, we shall observe in the case of the blood of the bird that the well-known ovoid nuclei have escaped from the burst cases, are floating in the water, and collecting towards the lower part of the specimen, which must be examined with the glass still in an inclined position. In the specimen of human blood similar appearances will be observed; and I feel inclined to think, that a very few experiments, conducted in the manner described, will serve to convince any careful observer of the existence of a nucleus in the blood-corpuscle of the human subject.

The physical relations existing between the blood-corpuscle and the liquor sanguinis, dependent on the specific gravity and the influence of the laws of endosmose, are matters of great interest to the pathologist; and I shall, therefore, in this part of my lectures enter on physical considerations, and only treat of the chemistry of the subject so far as may be necessary to a full understanding of the view I am about to take. Physical conditions play a most important part in effecting the renovation of the blood, and I shall proceed to show the manner in which this function is performed. It is true that certain obvious means are adopted in order to supply the fibrinous, albuminous, serous, and saline ingredients composing the liquor sanguinis, by admitting into the circulation a liquid which is produced by the digestive process, and afterwards modified by other chylopoietic organs into chyle; but the manner in which the complicated structure of the corpuscle receives nutrition is not at first quite so apparent, though it must form not only an important part of the process, but one immediately necessary to the maintenance of life.

The analyses of chyle and lymph,—the one taken from the lacteals before reaching the thoracic duct, the other from the absorbents of the lower extremity,—will show you that these liquids contain a large proportion of the ingredients necessary to the formation of liquor sanguinis; and you will perceive that the lymph returning into the thoracic duct (assuming it once to have existed as chyle) has, during its passage through the organism, lost a proportion of each of those ingredients which are most necessary to supply the waste occurring in the body. The fibrinous, albuminous, serous, and saline matters, have been used in the vital processes, and all that may be again wanted returns in the form of lymph into the thoracic duct. The supply of material to the corpuscle, however, to compensate for the loss necessarily sustained during its existence in the circulation, cannot, you will perceive, be carried on with the same facility afforded to the liquor sanguinis, which at once mixes with the pabulum poured in through the thoracic duct. In the case of the corpuscle, we have an organic structure, a membrane containing a coloured liquid, which is to be constantly renovated to assist in the important function of respiration; for, whatever some modern theorists may have advanced, it can scarcely be doubted by any who are experienced in physiology that the change of colour from blue to scarlet, which takes place in the lungs, is not a principal part in that process, and immediately connected with the absorption of oxygen by the blood. Before I describe the arrangement by means of which this red colouring matter is supplied, I must premise that this substance, which exists dissolved in the liquid contained by the envelope, is the true locus of the iron contained in the blood; the proofs of which will be hereafter noticed.

Now there are two conditions which must be fulfilled in order to supply iron to the corpuscle: in the first place, a liquid containing iron in solution must be brought in contact with it; and secondly, this liquid must be enabled to enter through the membrane freely, or it will scarcely answer the required purpose. If we regard the entrance of chyle into the blood as a means of obtaining the required condition, we shall find that we already know sufficient of the structure of that fluid to enable us to perceive how admirably it is adapted for the purpose in question. The chyle, like the blood, separates, when removed from the body, into two parts, serum and crassamentum. The former of these is a limpid fluid, containing matters intended for the supply of the constituents of the serum of the blood; the latter is a white mass, composed of fibrin intermixed with certain globules and granules.

Now the serum of the blood contains no iron, but the serum of the chyle contains it in abundance; and while the crassamentum of the blood contains iron, the crassamentum of chyle is free from it, or affords only such a trace of the metal as may be accounted for by the adhering serum. The iron of the chyle thus contained in its serum is in a very soluble form, and ready to be applied to the envelopes of the corpuscles for admission through their membranous structure: but another condition is requisite before this can be allowed, viz. there must exist a difference of specific gravity between the chyle and the contents of the envelopes; otherwise this transmission of fluid will scarcely occur, or at any rate can only be effected, after a great length of time, by the slow process of imbibition. The chyle, however, is far below the specific gravity of the liquor sanguinis, and thus, when it enters the circulation, every corpuscle with which it comes in contact will, in accordance with the law of endosmosis, immediately be entered freely by the liquid, which will mingle with its contents, and afford a supply of iron to the red colouring matter. It is obvious that this effect will not only be observed on the corpuscles in the immediate neighbourhood of the opening of the thoracic duct, for this fluid, of light specific gravity, entering the blood, will of necessity dilute the liquor sanguinis, and thus induce an endosmodic current, rich in iron, to penetrate into the corpuscle, further removed from the point of entrance. The equilibrium between the contents of the corpuscle and the liquor sanguinis will, in fact, be disturbed, and endosmodic currents induced. It will now at once be seen, that if from any cause the liquor sanguinis be lowered in specific gravity, or the chyle have its specific gravity raised, we can no longer expect to have a normal proportion of colouring matter secreted; and it will be hereafter my object to show the secondary mischief so induced, as one of the most interesting of pathological conditions, and one which promises to throw much light on physiological questions of the highest importance. Though the exact nature of the changes which occur for the production of the red colouring matter are still involved in mystery, it is a point not altogether devoid of interest to have ascertained the manner in which one at least of its essential ingredients is supplied. This action of supplying iron to the corpuscles must of course be in active operation during their growth, and all who are familiar with the microscopic appearances of the blood must have observed that the corpuscles differ greatly in size, the smallest being scarcely half the diameter of the larger ones, and a great variety of intermediate sizes are presented. It is probably in this stage of development that the action of the chyle is the most energetic.

Having now stated what I believe to be the relative physical conditions of the corpuscle, I will proceed to consider the liquor sanguinis in its disintegrated state, that is, after coagulation, when it has separated into serum and fibrin. This fluid, liquor sanguinis, was first correctly described by my esteemed friend, Dr. Babington, who, in a valuable memoir read before the Royal Medical and Chirurgical Society, showed its true character: for though Hewson had made the observation that a coagulation occurred when the upper layer of inflamed blood about to coagulate was skimmed off, he did not draw the important inferences from his experiment which a true understanding of the subject would necessarily have brought to his mind, and it was left for Dr. Babington to demonstrate on healthy blood that which had before been observed only in its diseased conditions; and it is to him that we are indebted for that clear view of the condition of the blood while circulating, which regards it as made up of a homogeneous fluid containing floating corpuscles; for he was certainly the first to demonstrate the composition of the fluid, to shew it to be a normal constituent of the blood, and indeed to propose for it the name of liquor sanguinis. If, then, we obtain the liquor sanguinis by skimming from off blood about to coagulate that portion of bluish liquid observed close to the surface, we shall see that the vessel in which this is collected will very soon become coated with a layer of fibrin, and that a pellucid serum has separated from the coagulum so formed. Here, then, we have the fibrin and serum of the blood, which, together, formed the liquor sanguinis; and while the corpuscles of the blood were subsiding, we have been enabled to skim off part of this liquid in which they were held suspended.

I have now described the physical separation of the blood, not only so far as it is generally performed, viz. by dividing it into serum, fibrin, and red corpuscles, but, as I have shown, we have, by the addition of water to the red corpuscles, been enabled to divide them into their constituent parts, viz. envelope, nucleus, and colouring matter, the two former sinking as a precipitate, and the latter remaining dissolved in the water used for disintegration. This is a separation effected by purely mechanical means, and is entirely independent of the aid of chemistry. There is a further mechanical separation, however, of the serum, which we effect by simple dilution with water, so that certain constituents of the fluid existing in suspension in its ordinary state are allowed to subside, in consequence of the specific gravity of the liquid becoming lessened; and I have reason to believe that the constituent of serum thus separated occasionally plays an important part in the course of some diseases marked by an excess of water existing in the circulating blood. This solid constituent of serum, owing to its physical qualities, does not disappear with the fibrin when the liquor sanguinis becomes coagulated. It is very easily prepared: we have merely to dilute the serum with about ten times its bulk of water, and allow subsidence to take place, which occupies generally some hours. The clear liquid may then be poured off, and the precipitate thrown on a filter, and washed with distilled water.

We have now divided the blood physically into the following constituents:—fibrin, serum, suspended particles of serum, envelopes, nuclei, and red colouring matter. In effecting these separations, the evidence afforded by the use of the microscope has been indispensable; but I have not yet described all that is to be observed by the use of that instrument.

When the corpuscles are examined microscopically in recently drawn blood, we observe occasionally that semi-transparent bodies of a pale colour occupy part of the field: these are few in number, and it is frequently necessary to search over the whole of the specimen in order to obtain a good view of them. They are larger than the red corpuscles, and have been called the fibrinous globules or corpuscles. When closely examined by a good light, their surface appears granulated, and marked all over with waving shining lines. When the blood solidifies, these bodies are involved in the coagulation of the fibrin, and form a part of the clot. The use of these corpuscles is as yet undetermined: they are believed by some to be identical with the corpuscles observed in the chyle and lymph, to which they certainly bear a close resemblance: they have also been considered as capable of becoming exudation corpuscles, such as are seen in coagulable lymph effused on granulations, and by a further change to become converted into pus corpuscles. When blood is mixed with solutions of high specific gravity, these bodies do not undergo the collapse immediately produced on the red corpuscles; they are evidently soft solids, and require long maceration before they contract or expand by the application of solutions. When fibrin is deposited from serous fluids, or from the liquor sanguinis, these colourless corpuscles are seen under the microscope enclosed by the fibrin; and they exist in large numbers in the membranes which frequently deposit from serous fluids drawn off by paracentesis. Such serous effusions are, in fact, liquor sanguinis, but they generally contain less solid matter than the fluid of the blood.

The presence of a large number of these fibrinous corpuscles in the deposits of fibrin I have above alluded to, and more especially on healing surfaces exuding coagulable lymph, has led some to a belief that such corpuscles are produced after effusion of the fibrinous liquid, and not ejected from the vessels in the form shown under the microscope. Now it is a difficult thing to believe that a structure so well and firmly organized as the fibrinous and exudation corpuscles appear to be, should be formed by the series of changes occurring out of the body on coagulation. If such be the case, we know of no analogous fact of the kind, and I do not see those difficulties in explaining the transit of such bodies through pores which refuse admission to the red corpuscles, that some consider to be valid objections to the possibility of their exudation as solids.

It would certainly, at a first view, appear difficult to explain how the red corpuscles of the blood escape extravasation, if the fibrinous corpuscles, which are larger by far, are exuded; but if we regard the organization of these two kinds of bodies, we shall, I think, at once perceive conditions rendering such an occurrence extremely probable. If we remember the physical qualities appertaining to a structure such as the blood-corpuscle, we shall perceive that they nearly resemble those of a bladder filled with fluid, while the structure of the fibrinous corpuscle more nearly resembles that of a sponge, and it of necessity possesses physical qualities more adapted to enable it to pass through an orifice of less than its own diameter. This cannot be the case with the blood-corpuscle, which is unyielding until its membrane is ruptured, and its fluid extravasated. The number of fibrinous corpuscles contained in the blood may to some appear too small to account for the sudden appearance of these bodies as exudation corpuscles on a secreting surface; but here, again, a little consideration will serve to show that this idea has arisen from a comparison of their number with that of the red corpuscles, which in this respect exceed them greatly, and that we cannot positively state them to be few, inasmuch as it is difficult to draw a single drop of blood that will not show us several specimens fully developed.

It will be remembered that the corpuscle has already been described as made up of three constituents, viz. an envelope, a nucleus, and a red colouring matter enclosed by this envelope or sac; and I shall now proceed to describe the manner in which Mr. Lane and myself have been led to believe that those constituents are arranged. The human corpuscle is circular in form, flattened, and has been described as presenting a double concave surface. Its diameter measures on an average 1-3250 of an inch. This circular form is given by the envelope, which is distended by contained fluid, and is a delicate membrane, or vesicle, firmly adhering to the surface of the nucleus at its centre. This nucleus is flattened and circular like the envelope, is contained within it, but does not fill it, being only two-thirds its diameter; but it is situated in the centre of the envelope, and is adherent, as before stated, to the membrane at its centre only; leaving a canal all round its free edge, which canal contains the red colouring matter. The nucleus, though flattened and circular, differs from the envelope in not being rounded at its edge. It measures about 1-4500 of an inch in diameter. Now, though it is not my intention to enter at length on a description of the various methods at present in use among chemists for analysing the blood, I cannot refrain from directing attention to the subject on the present occasion, as there are difficulties in the way of effecting this, which those who have not combined the study of minute anatomy with chemical knowledge can scarcely have felt, and, until some understanding exists, among those who make anatomy and physiology their pursuit, on several points which at present divide opinions, we can scarcely hope that the application of chemistry to the furtherance of pathological research will be productive of those benefits which so many have hoped to see realized. The attention of chemists has, up to the present time, been very much directed to the detection of variations produced by disease in the proportions of the three principles or constituents of the blood, viz. the serum, fibrin, and red corpuscles; and a multitude of analyses have been made for the determination of these points in various diseases, and we have as yet adopted no other mode of inquiry (except it be to detail certain adnormal constituents of serum) to discover variations from the established healthy standard. No experiments have been made, for instance, with a view of ascertaining any variations in quality which probably occasionally exist in the normal constituents of blood; the chemical characters of its colouring matter are not well described or understood, and the gases contained are not yet sufficiently examined in health to afford a normal standard of indisputable correctness. The methods at present in use for examining the blood quantitatively will be considered very faulty by all who are well acquainted with even the most obvious physical properties of the blood-corpuscles. The most approved method of chemically ascertaining the proportion of fibrin, serum, and hæmatosine in the blood, is the following; but I must premise that hæmatosine is frequently used to express corpuscles, for it is the weight of these bodies, and not that of the true hæmatosine, which some chemists obtain by their analyses—a fact showing what disadvantages we labour under, even at the present moment, from a positive want of information on the part of some of those who are employed in chemical analysis. The most approved method of examination is as follows:—A portion of freshly drawn blood is poured into a bottle closed by a glass stopper, and containing fragments of lead; this is agitated for several minutes, and weighed, to ascertain the proportion of blood used; the lead is then withdrawn, having the fibrin adhering to it; this is removed, and carefully estimated, after drying and washing, allowance being made for the presence of adherent serum. The fibrin being got rid of, the corpuscles are allowed to subside in the serum, which is then poured off, and means taken to ascertain its constitution. The corpuscles are now dried, having been weighed in the moist state, and the weight when dry subtracted from the weight when moist, which, of course, gives the quantity of water present in the moist mass. This water being regarded as forming part of the serum adherent to the corpuscles in the moist state, enables us to ascertain how much of the solid dry matter is to be considered as solid matter of serum; for having performed the analysis of the serum decanted, of course we have ascertained the relative proportions of water to solid matter contained in it. The quantity of solid matter, then, indicated by the water evaporated from the moist corpuscles, is subtracted from the whole weight of the dry mass of corpuscles and serum, and the difference gives the weight of dry corpuscles. The weight of the solid matter of adhering serum is of course carried to the account of the serum in the analysis.

From what you already know of the physical characters of the blood, you will at once perceive that the corpuscles are estimated here, and not the hæmotosine, as some have presumed; that the blood is divided into serum, fibrin, and corpuscles, and that the weight of the hæmatosine contained within the envelope of the corpuscle is not ascertained. It is important that you should be aware of this, as pathologists, for the red colouring principle has peculiar and important duties to perform, in virtue of its chemical characters, which are quite distinct from those of the envelope and nucleus, which are estimated with it in this form of analysis. There is another point to which I must beg your attention, as it shows the absolute necessity of a knowledge of physical structure for those who are occupied in the analysis of the blood. It will be remembered that the first step I described consisted in ridding the blood of fibrin by agitating pieces of lead in a weighed quantity of the fluid, in order that the pieces of metal might collect the fibrin, which could then be removed, washed, and estimated.

From what you now know concerning the physical qualities of the blood-corpuscle, you will at once perceive that from the moment coagulation of fibrin commences, the liquor sanguinis will decrease in specific gravity, owing to deprivation of part of that solid matter which it before held in solution. The necessary result of this must be the establishment of an endosmodic current tending to fill the corpuscle, which will now become rounded and distended. Now, since it is probable that in some diseased conditions the specific gravity of the liquor sanguinis may become considerably lowered before the whole of its fibrin deposits from solution, it is to be expected that every corpuscle will be enclosing within its envelope a certain quantity of this principle (fibrin), which will enter it by endosmosis dissolved in the liquor sanguinis, which has become lowered in specific gravity. In this manner we see how it must probably happen, during this first step of analysis, that a certain portion of the fibrin which, in the natural condition of the blood, existed as a constituent of the liquor sanguinis, will be estimated as hæmatosine, or, rather, have its weight added to that of the corpuscles; the weight of fibrin being proportionally diminished. That the weight thus lost may be very considerable, when the fibrin coagulates slowly and imperfectly, appears pretty certain, for the liquor sanguinis is closely studded with red corpuscles, every one of which will take on this action, and enclose a portion of fibrin. If we consider the condition of corpuscles which have endosmosed serum (an action which must always occur) during the coagulation of the blood, we shall perceive that the determination of the proportion of the solid matters of serum has also been interfered with owing to this endosmodic action. According to the view taken by the chemists, we ought to consider the corpuscle of the blood as a solid impermeable body, and the whole of the moisture adherent to it should be water, which at one time had formed serum; whereas our knowledge of structure at once enables us to perceive that this proportion of water is in part a constituent of the fluid contents of the corpuscle, which is not serum either in its chemical or mechanical characters, being red in colour, and containing iron, and, moreover, possessing in its natural state a specific gravity exceeding that of the serum; being, indeed, as heavy as the liquor sanguinis. I am anxious that this source of variation in the perfection of chemical analysis, as now performed, should not be considered as a trivial cause of error; and must therefore again call to mind the enormous multitude of floating corpuscles in the liquor sanguinis, as it exists in the blood, each of which will tend by endosmodic action to vary the correctness of results obtained by chemists, who have conducted inquiries as though these floating bodies were composed of solid tissue.

It appears probable that the analyses of the entire blood which have been made up to the present time are extremely faulty, and that though they have served to show a difference in the constitution of the fluid in health and in disease, when submitted to the same ordeals of manipulation, still they do not possess that absolute correctness which is desirable, and indeed necessary, to enable us to reason correctly on the differences so detected. The point of view in which the examination of the blood should be regarded, in order to render the services of the chemist available to the pathologist, would appear to be that which should embrace the examination of the liquor sanguinis as serum containing fibrin in solution, and, if possible, should treat of the contents of the corpuscles as they exist in the circulation, or as nearly so as possible: we must always be liable to error if we prosecute analysis, as it is at present performed, by operating on corpuscles changed by endosmodic action in consequence of the removal of the fibrin from the liquor sanguinis. They are no longer in their natural state, but are distended with serum immediately on the blood coagulating, and thus have within them a fluid foreign to their healthy constitution.

The difficulties which I have here shown to exist in obtaining a correct analysis of the blood will serve to impress you with the great importance of an acquaintance with physical structure on the part of those who would apply chemistry to the service of physiology. It is, indeed, not only difficult for one who does not combine these two branches of inquiry to make useful observations in the service of either science as applied to the study of the blood, but it is a matter of impossibility for any one exclusively devoted to either pursuit even to determine the point at which physical methods of examination should terminate, and chemical analysis commence. I cannot do better on this occasion than quote the error already alluded to, which has been made by almost every chemist of the day, in considering the corpuscles of the blood as hæmatosine, whereas they are really organised structures, containing hæmatosine as one of their constituents; for though their weight, correctly ascertained, must bear some comparative relation to the quantity of hæmatosine present, still that which has been presumed by the chemist to be red colouring matter has really in great part been composed of white albuminous matter, viz. envelope and nucleus.

Had the physical structure of the blood been better understood, these errors might have been avoided; and it is to be hoped the time is not far distant when our knowledge will enable us to devise some more perfect method of analysis.

This want of knowledge of physical structure has greatly interfered with our possessing correct information as to the chemical characters of hæmatosine, or the red colouring principle, in its natural state; the processes recommended for its preparation betraying on the part of those who have proposed them a great deficiency in this respect. It is not long since, that, in order to separate hæmatosine, Lecanu recommended that the blood should be mixed with sulphuric acid as a first step in the process; thus embarrassing the result with the products of the action of that acid on the envelope of the corpuscle, which must of necessity be burst or dissolved before the red colouring principle can be attacked: nor can we then obtain what we desire, viz. hæmatosine in solution, free from the action of any reagent, and in the condition in which it existed in the circulation. Had we attained our present degree of acquaintance with the anatomy of the blood-corpuscle when the examination of the blood was first pursued by chemists, our knowledge of the colouring principle would have been greatly in advance of its present position; and I will proceed to show how we now have the means of examining the soluble coloured contents of the corpuscle freed from extraneous matters, and probably much in the condition in which it existed in the circulation. The success of this method of extraction depends entirely on those physical properties of the corpuscle to which I have called attention.

We first proceed to obtain the corpuscles in a pure state, and washed clean from the solution of animal matters in which they float. You now know that this can be effected by pouring freshly drawn blood into a solution which has a specific gravity the same as that of the liquor sanguinis, and which will therefore allow the corpuscles to subside in a mass, freed from a considerable portion of the albuminous liquid in which they floated.

This solution into which the blood is to be drawn may be made with salt and water, or sugar and water, the principal object being to obtain it of the same specific gravity as the liquor sanguinis. The corpuscles having subsided through this, and collected as a precipitate, for which purpose a period of rest should be allowed, we are to pour off the supernatant liquid, and again pour some more of the solution of sugar or salt upon the corpuscles, allow these to subside, again pour off, and so on till all the albuminous liquor is removed by the washings. We now have the corpuscles in a form which admits of their being exposed to solution, and which we effect by pouring them as a subsided precipitate into a vessel of distilled water. This breaks their cases by rapid endosmosis, and dissolves the colouring matter contained within. If this mixture be set aside we shall now perceive the white stratum of envelopes and nuclei, which I have before described, forming as a precipitate, while the supernatant liquor is of a bright clear red colour, and is composed of hæmatosine, dissolved in water, and, consequently, presented to us in a favourable condition for examination.

The pure state in which we are enabled to obtain hæmatosine by this plan of operating affords us an excellent opportunity of ascertaining whether the iron contained in the red corpuscle is a component of the hæmatosine, or of the envelope and nucleus; and I may state that careful examination has persuaded me that the whole of the iron of the blood is contained in this red colouring principle, while the nucleus and envelope do not present the slightest trace of it. This is a matter of some importance, for though some operators have succeeded in extracting iron from the hæmatosine without interfering with its red colour, it does not the less follow that hæmatosine needs the iron, with which in nature it is always combined, to discharge the offices assigned to it; nor does it follow, because these chemists have obtained a red coloured matter from hæmatosine, that such red coloured matter is the same as the hæmatosine existing in the blood: everything, indeed, that we know, would tend to disprove the correctness of such an idea.

The following is a short contribution to the Guy's Hospital Reports (No. 10), which treats of the proportion of urea found in the fluids in the Morbus Brightii.

THE existence of urea in the blood, in several forms of disease, has long ceased to be a matter of doubt in the minds of chemists. I am not aware, however, that the *proportion* in which that substance exists in morbid blood or secretions, has yet been very accurately determined. In attempting to throw some light on this subject, I have at different times examined fluids obtained from patients at Guy's Hospital; and now have the advantage of being able to refer to Dr. Bright's report of two of those cases, from the subjects of which I obtained, through his kindness, the specimens for analysis. Before relating the results of my examinations, I wish to describe the method which I have adopted in order to separate the urea perfectly free from contamination, and at the same time to avoid that loss which is inevitable when obtaining that substance for estimation in the form of nitrate.

Those who are accustomed to the manipulations of animal chemistry will at once recollect the uncertainty they have felt as to whether the whole of the urea were separated by nitric acid from the mother liquor; and how tedious and unsatisfactory have been the subsequent processes of evaporation, to crystallize the remaining nitrate.

The relation of urea to ozmazome, as regards solubility in various menstrua, has rendered its separation from that substance a matter of great difficulty; and there is every reason to believe, that when nitrate of urea crystallizes from the extractive matter, its weight is much increased, by an unavoidable adherence of the latter principle. I am quite satisfied in my own mind that this cause of increased weight in our results greatly outbalances any loss which occurs by the imperfect crystallization of the nitrate before alluded to; for by the more perfect method which I now employ, I have always obtained a far less proportion of urea than formerly, although the risk of losing any of the principle present is not nearly so great as that incurred by the usual process.

The plan I now adopt is very delicate; so much so, that urea can be obtained perfectly pure from an animal fluid which contains it in the proportion only of 0·15 per mille. The analysis is performed as follows: —The serum, or effused fluid, is evaporated to dryness, at a heat sustained somewhat below 212° Fahrenheit; the dry mass is broken up, boiling water thrown upon it, and allowed to digest several hours. This liquor being carefully poured off, a second portion of water is added, and allowed to digest; after which, the whole is thrown on a filter, and the solid matters washed with distilled water till the percolating fluid ceases to effect a solution of nitrate of silver. The digested and filtered liquors are next evaporated to dryness, by a gentle heat ; and the extract, so obtained, digested in a stopper-bottle, with common ether of the shops, of sp. gr. 0·754. This menstruum extracts the urea only ; and by digesting successive portions of it until the last added yields no deposit of that principle on evaporation, we obtain the whole of the urea present, and thus directly estimate its weight. As obtained by this process, urea is quite pure and colourless. It once happened to me to observe some slight contamination of the urea, obtained as above, by fatty matter which had escaped separation with the albumen : this, however, was easily got rid of, by dissolving the urea in distilled water, and throwing the solution on a filter previously moistened, when the fatty matter remained behind, and allowed the urea to pass through perfectly pure.

The first fluid which I shall mention, as examined by this process, was obtained from John Gillmore, Dec. 18, 1839,—a case of albuminuria. It was an effusion on the brain, and 210·4 grs. were obtained for examination. From this quantity 0·05 gr. of urea was obtained, equal to about 0·415 per mille. This fluid yielded but slight traces of albumen.

The second case from which I obtained the serum of the blood, and likewise a portion of fluid which was procured from the cellular tissue by making punctures in the scrotum, was that of John Wiseman, a boy in Job's Ward, under the care of Dr. Bright.* The serum of this patient was of sp. gr. 1015, and contained only 23·49 gr. of albumen in 500 grs.; whereas the same quantity of healthy serum affords about 39·75 grs. It contained 0·2096 per mille of urea. The fluid obtained from the scrotum was of sp. gr. 1037.9: the analysis of 500 parts gave,

Water	492·400
Albumen	0·800
Extractives and Salts . .	6·725
Urea	0·075
	500·000

the proportion of urea being equal to 0.150 per mille.

The third case, from which I obtained the serum of the blood at two different times, and also the fluid effused into the pericardium, was that of Susan Smalling, a patient of Dr. Bright.†

The first specimen of blood was received on March 4th. The specific gravity of its serum was 1025, being somewhat lower than natural: the analysis of 500 grs. yielded,

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* Vide No. 8 of Dr. Bright's Cases, Guy's Hospital Reports, No. X.

† Vide No. 21 of the same Cases, ibid.

Water	425·10
Albumen	32·50
Extractives and Salts	15·15
Urea	0·25
	500·00

We here observe a deficiency of albumen, an increase of extractives and salts, and the presence of an ingredient foreign to the serum. The second specimen of blood which I received from this patient was obtained by cupping, and not from the arm, as was the case with all the previously-mentioned specimens. It was sent to me on the 30th of April. The specific gravity of its serum was then 1029, or natural: the analysis of 500 parts was as follows:—

Water	448·3
Albumen	40·8
Extractives and Salts	10·65
Urea	0·25
	500·00

The effusion into the pericardium of this patient was of sp. gr. 1028. It yielded urea, but only a trace in 500 grs. of the effusion.

It will be observed, from the analysis quoted above, that the largest proportion of urea which I have detected in the blood is 0·5 per mille, and the least 0·2096. The effusion on the brain gave 0·415; the fluid effused into the cellular tissue of the scrotum, 0·150 per mille; and the pericardial fluid merely a trace in 500 grains.

The condition of the blood in the patient Susan Smalling is worthy of consideration, inasmuch as the serum of the blood underwent a great change between the dates of March 4th and April 30th; it being sp. gr. 1025 on the former, and 1029 sp. gr. on the latter date: the proportion of urea, however, remaining the same. The serum of the 30th of April, if we except the existence of urea, may be considered as normal; the albumen being present quite to the natural extent; indeed, if any thing, somewhat beyond the amount generally found in the serum of healthy blood.

The case from which the scrotal fluid was obtained affords an instance of great decrease in the specific gravity of the serum of the blood. The lowest specific gravity mentioned by Dr. Christison, in his lately published valuable work, is 1019: this specimen was, however, only 1015 sp. gr.

Feeling great confidence as to the delicacy of the process which I have described as applicable to the detection of urea, I was anxious to apply it to the examination of the serum of healthy blood, which, by some authorities, has been stated to contain urea. Before the present method of analysis occurred to me, I had examined the serum of healthy venous blood without being able to detect urea in it. I determined, however, to examine the serum of healthy arterial blood by this new method, in order more completely to satisfy my mind on the subject. For this purpose, serum was obtained from blood drawn from the temporal artery, and submitted to the new process, but no evidence of the presence of urea could be obtained; though I know, from previous experiments, that I could not have failed to detect it, had it existed even in so small a proportion as 0·2096 per mille.

ALBUMINOUS URINE IN CONNECTION WITH THE PUERPERAL STATE.

It occasionally happens that the urine contains albumen during utero-gestation. This fact, which was first observed by the late Mr. Alexander Tweedie, of Guy's Hospital, has since been noticed and further elucidated by the researches of Dr. Lever. Women who are the subjects of puerperal convulsions always pass albuminous urine; and as these two conditions are frequently complicated with anasarcous swelling of the upper parts of the body, we at once see some apparent relation between such cases and those of real kidney disease connected with albuminous urine.

It must be remembered, then, that anasarca and coagulable urine may exist in cases of puerperal convulsions independently of any disease of the kidney whatever; while albuminous urine *alone* may be often expected during gestation, the kidneys being unaffected. The greatest obscurity exists at present in respect to the pathology of this condition. One point worthy of remark is, that no urea is to be detected in the blood of those suffering from puerperal convulsions,—a fact, so far as it goes, bearing out the view I have taken, and which is adverted to in the body of the work, in respect to the convulsions of kidney disease, viz. that they are not caused by the urea circulating in the blood.

A further important fact affecting this point is, that persons who have been the subjects of true kidney disease, and in whose blood urea has been circulating, have gone through utero-gestation without any convulsions whatever. My friend, Dr. Henry Oldham, who has paid much attention to this subject, and from whom I have at different times received much valuable information, is inclined to connect the albuminuria and convulsions of pregnancy with the existence of an excess of fibrin in the blood. One chief reason for this opinion is, that we generally observe such cases to occur among primiparous women, in whom the blood is always highly charged with fibrin. The immediate relief afforded by blood-letting is also used as an argument by Dr. Oldham in support of this view.

An opinion has been lately promulgated, that the excretion of albumen in the urine, under the circumstances above noticed, is connected with an increase of the fatty constituents of the blood. This, however, is not borne out by the results of analysis, such increase of fatty matter, when present, being accidental, and by no means necessary to the full development of the conditions I have described.

An excess of fatty matter has frequently been noticed in the blood of those labouring under the Morbus Brightii; but as this is far from always the case, and as I have generally seen it in such patients as are able to take nourishment, I feel great uncertainty as to whether it be not an effect of chylification, and that the opaque milky appearance of the serum occasionally observed is due to the same conditions which tend to produce it in health. My reason for believing this is, that I have so frequently found the serum clear; and when I have seen it opaque and milky, I have generally found that the patient has been permitted to take food improperly, and shortly before the bleeding was performed.

THE END.

Wilson and Ogilvy, 57, Skinner Street, Snowhill, London.

(*Corrected to October* 1847.)

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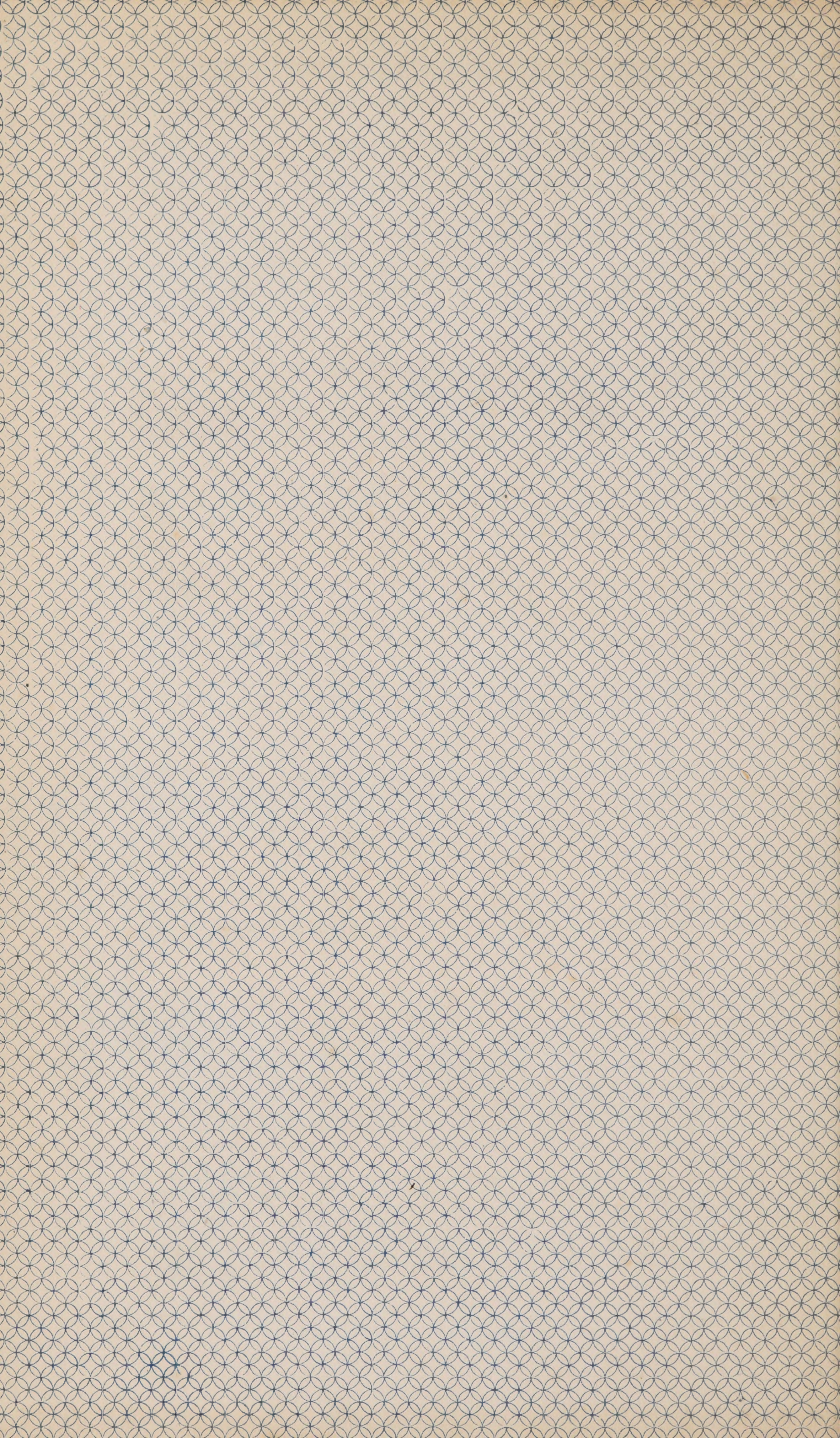

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